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JOURNAL OF THE COOPER ORNITHOLOGICAL CLUB

THE CONDOR

JOURNAL OF THE COOPER ORNITHOLOGICAL CLUB

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TRES MARÍAS RED-BREASTED CHAT

GRANATELLUS VENUSTUS FRANCESCAE

One-half natural size

Painted in 1865 by Andrew Jackson Grayson

THE CONDOR

VOLUME 51 NOVEMBER-DECEMBER, 1949 NUMBER 6

NESTING OF THE MEXICAN JAY IN THE SANTA RITA MOUNTAINS, ARIZONA

By ALFRED O. GROSS

In the live oak woods of the Santa Rita Mountains in southeastern Arizona, the Mexican Jay (*Aphelocoma ultramarina*) is one of the most striking and abundant species of birds. Here it is represented by a race well known as the Arizona Jay (*A. u. arizonae*). Opportunity to observe the nesting activities of this jay came to the author when he was camped in Madera Canyon, at 5000 feet altitude, in the period from April 2 to June 15, 1948.

Bands of boisterous, noisy jays were among the first birds to attract our attention when we arrived in the canyon. The next day they were quick to discover the feeding shelves which we erected near camp and they continued to be our constant companions throughout our stay. Their daily visits gave us an excellent opportunity to become well acquainted with them. They never came alone but always as garrulous bands of four or five to a dozen or fifteen individuals. Long before they were seen, their presence was well announced by their loud *wheat wheat* calls. Regardless of other birds that might be peacefully feeding on the shelves, they would land with a loud flutter of their wings, causing juncos, towhees, grosbeaks and others usually present to scatter in all directions and take cover in the nearby trees and shrubs. Only the White-winged Dove ever braved their onslaughts, holding them at bay to keep possession of the tray for itself. This dove always exhibited a defensive and sometimes an aggressive attitude, not only toward jays, but also toward other birds.

Mexican Jays are omnivorous in their feeding habits. They ate freely of seeds, acorns, cracked corn, fruit, meat, suet, insects and anything that was available, but they seemed especially fond of bread. Large chunks of moist bread were gulped down, and before leaving the shelf they would snatch up not one, but two or three large pieces in their beaks and fly away to give place to their fellows. Such food, taken from the shelf, was hidden in crotches or cavities of trees, and I saw one jay take a large piece of crust, fly to the ground, and deliberately cover it over with fallen live oak leaves. This bread was subsequently retrieved, presumably by the same individual. Later in the season they were seen carrying pieces of bread to feed their equally voracious young. In that extremely dry climate they exhibited an insatiable thirst and like most of the other birds drank freely of the water which was kept in cans and jars on the feeding shelf.

NESTS AND NEST-BUILDING

Among the live oak trees about our camp I examined no less than twenty old nests of jays, within a radius of a half mile, that had been used during previous nesting seasons. It was obvious that at an altitude of 5000 feet we were within the area where this species is especially abundant in the Santa Ritas. The birds were by no means restricted to this altitude, for even in the nesting season, as late as April 17, several Mexican Jays were seen with a band of Steller Jays (*Cyanocitta stelleri*) near the top of Mount Baldy at an elevation of over 9000 feet. Their nomadic bands were also seen

in the forest margins at the edge of the desert, but no nest was discovered at these extremes of altitude.

The first occupied nest of the Mexican Jay was found on April 10, 1948, and contained four eggs. A fifth egg was laid the following day. This nest was situated 21 feet above the ground in a live oak tree eight inches in diameter at the base and approximately 35 feet tall. The nest was built firmly against the trunk of the tree and was supported by three lateral branches and several small, living twigs. The nest was made of crooked twigs, chiefly of the live oak, many being 10 to 12 inches in length and the larger ones a quarter of an inch in diameter. The mass of twigs measured 15 inches from side to side and ten inches in total depth. The well-formed nesting cavity measured 3¼×3¾ inches in diameter and 2¾ inches in depth. Lining the mass of larger sticks was a layer of smaller twigs mixed with grass and weed stems. Inside of this was a layer of fine tendrils and hair-like rootlets which were intricately interwoven to make a smooth interior. The nest was collected soon after the young left and is now before me. The sticks are so well interlocked and bound together that the entire structure was easily moved intact from the tree. After having been used by the birds for a period of 18 days of incubation and then 25 days more by the young, it is still clean and in excellent condition. The nesting cavity is now much flattened, as compared to its condition when it was first completed, having been pressed down by the adults and later by the young standing on the brim. The depth of the cup is now scarcely 1½ inches instead of the original 2¾ inches.

A nest containing three eggs, found on May 20, 1948, was placed in the main fork of a small live oak at a height of eight feet from the ground. The tree was 3½ inches in diameter at the base and about 15 feet tall. It stood on the side of a hill in a dense growth of larger oaks. This nest had an over-all diameter of 13 inches and a total depth of ten inches. The nesting cavity was 3×3¼ inches in diameter, with a depth of 3½ inches. The foundation material was similar to that of the first nest described. The longest oak twigs were 12 inches but the majority ranged from 5 to 10 inches in length and less than a quarter of an inch in diameter. The lining of this nest was very different, being made up entirely of long horse hair and masses of short hair, no rootlets or other material having been used. The hair composing the lining was also carefully and intricately interwoven, producing a very neat and smooth interior. These two examples are typical of the nest architecture as I found it in the Santa Ritas.

Twelve occupied nests were found in Madera Canyon during the time spent there. All these nests were in live oak trees and they varied in height from one only six feet above the ground to one that was saddled in a fork near the end of a horizontal branch of a large oak, 54 feet from the ground. The average height of the twelve nests was 19 feet.

On April 9, a nest was found in the first stages of construction. At that time there were not more than a dozen sticks that were lodged against the trunk of a small tree and supported by four lateral branches at a height of 16 feet above the ground. This nest was being built not by a single pair of birds, but at times by as many as seven or eight. This well-known communal habit is one of the interesting and peculiar characteristics of the Mexican Jay. The birds always appeared at the nesting site with a great deal of ceremony, uttering loud *wheat wheat* calls and with intermittent curious fluttering of their wings. Usually only one, rarely two, but at one time three of the jays were carrying sticks as they arrived. The other members of the band alighted in the branches of the nesting tree and exhibited a great deal of interest in the entire procedure. One bird would carefully manipulate a stick into the desired position after repeated trials and then would give place to a second bird carrying a stick. At times the other members of the

band would fly down and rearrange the materials previously added. When the sticks had been arranged, they flew away well out of sight of my blind, calling noisily. In ten minutes four of the jays reappeared with only one carrying a stick, which was added to the growing structure. The other three perched in the tree only a few feet from the nest. Two of them inspected the nest and then all flew away. After fifteen minutes a band of eight jays appeared, two of them probably year-old birds, their age being revealed by the yellow or horn-colored basal portion of their mandibles. The younger birds were not seen to add nesting material at this time, but they succeeded in making a general nuisance of themselves in the procedure of nest building. Regular visits were made to the

Fig. 47. Mexican Jay arriving at the nest. Madera Canyon, Santa Rita Mountains, Arizona, June 5, 1948.

nest throughout the morning on the average of five visits each hour. Work was halted in the early afternoon, but the group was again active at 4 p.m. The jays were never seen to collect sticks from the ground although sticks were present there in abundance.

One morning while looking for other birds in the canyon I chanced to see a Mexican Jay tugging at a twig near the top of a live oak tree. The bird grasped the twig with its beak and pulled it from side to side. Not succeeding, it leaped and flew to grasp the outer end and with much fluttering attempted to free it. Another jay joined in and both took turns in a determined effort. After several minutes they succeeded in breaking it near the point of attachment. One of the jays then easily pulled it free from a strand of bark which still loosely held it and flew away with it. Later I saw a jay grasp a smaller dead twig which it broke with ease at the first attempt. After seeing these performances, I made a more critical examination of the foundation twigs of several nests. I was surprised to find that practically every stick had a freshly broken end which was not at all discolored by weathering. It was convincing evidence that the majority of the twigs forming the nest foundation had been broken off the trees by the jays and were not old sticks that had been gathered on the ground as one might suppose.

By the morning of April 12 the jays had a substantial mass of sticks in place although from below one could see the bright light of the sky coming through the narrow spaces between the twigs. At 8 a.m. six jays arrived at the nest, and one of them held a large compact mass of horse hair in its beak. It was made up of long hairs from the tail or mane twisted about and mixed with shorter hairs. Some of the individual hairs which I measured later were more than two feet in length. The bird sat in the center of the nest for four minutes while it carefully arranged each strand of hair. It frequently shifted its body to press and shape the lining of hair against the rough interior. During this time the other jays remained in the tree calling loudly and seeming to challenge any intruder that might enter their territory. At one time a Red-shafted Flicker (*Colaptes cafer*) alighted on the trunk of the tree above the nest and immediately it was chased away. However, the jays did not react to a Painted Redstart (*Setophaga picta*) and several Ruby-crowned Kinglets (*Regulus calendula*) that were flitting about in a nearby tree. After the bird in the nest had completed arranging the mass of hair in the lining, two of the other three jays took over; one of them sat in the bowl turning its body and shaping the interior and changing the position of some of the hair while the other jay perched on the edge of the nest, intently observing the whole procedure. It took its turn in the nest when the second bird was through.

I saw jays removing hair from the interiors of deserted jays' nests, and this proved to be the source of the major portion of the lining of this nest under construction. Hair is evidently used again and again, as every nest that has been deserted for any length of time is without a horsehair lining. Near the nests which were under observation was a horse corral. On the trees, fence posts and other places strands of hair could be seen, and this undoubtedly was the source of some of the hair; but although I watched these places many times, I never saw a jay collecting hair at the corral. On one occasion I saw several jays on the ground along a road, and one of them was pulling at some fine rootlets in a place where the surface soil had been removed by a road scraper. The jay pulled at one rootlet about eight inches in length, and after it was freed, it was left on the ground. After detaching two others, the jay gathered up the first and all were carried away, presumably to be used in a lining of some nest.

On the morning of April 13, the jays were again busily engaged with adding more lining material to the nest, coming at intervals of twenty or thirty minutes. The group varied from five to eight individuals and they always announced their arrival with loud *wheat, wheat* calls and the curious ruffled flutter sounds produced by manipulating their wing feathers in a manner I could not determine. From this time on the birds made many visits to the nest without nesting material, but at almost every visit two or more of them would take turns sitting in the nest, working the materials with their beaks and turning and fitting their bodies to shape the nesting cavity. Sometimes this procedure would require five to six minutes. At times one or more of the waiting birds would fly down and alight on the ground. They poked their bills among the fallen leaves and twigs as if searching for food or nesting materials, but I did not see that they obtained anything before the whole group left on another foraging trip.

On April 15, the jays were again working on the nest which now had a very thick lining of horse hair and some fine rootlets. A one-year old bird was seen with a small bit of nesting material.

On April 16, the nest appeared to be completed. No birds were seen at the nest during the morning, but at 2:45 p.m. a jay was seen to go on the nest and sit in the completed bowl. After this bird left the nest, a second jay took its place and remained for several minutes. During this time another jay arrived and presented the bird on the nest with some food which was readily accepted and eaten. There were five visits to the nest in

the afternoon. No nesting material was added, but the materials in place were given minor adjustments and were moulded, as previously described. On the following day the procedure of April 16 was repeated. At 11:40 a.m., five jays appeared. One went on the nest, but, unlike previous occasions, it uttered a continuous series of calls in concert with the others perched in the tree. After fifteen minutes all left the vicinity, flew up the mountain side, and were not seen again that day.

During the next few days I observed no visits to the nest, and as no eggs were laid it seemed that this might be a dummy nest which was not to be used further. A nest of

Fig. 48. Nest and eggs of the Mexican Jay. Photograph taken April 19, 1948.

this kind was observed later in the season. On May 3 a group started building a nest in an oak in the upper part of the canyon. The birds worked industriously, and by May 12 the structure was complete with a lining of horse hair. This nest was never used, but a second nest was constructed in another oak about fifty feet from the first. Presence of two peculiar birds in this clan, one a partial albino and the other a one-legged individual, made it reasonably certain that the same group had built the two nests in succession. All the lining and a few of the twigs of the first were carried to the second nest. Four eggs were laid in the latter, and the young were successfully reared.

On April 25 a jay was seen sitting on the nest the construction of which was described above and near which my blind was located. It remained there for more than an hour. I fully expected that it might be a female laying her first egg, but a subsequent visit to the nest revealed that only another try-out of the nest had occurred. Similar visits were made by the birds to the nest in the next three days, but no eggs were laid. Finally on April 29 the first egg was laid, a second on April 30, a third on May 1 and the fourth

and final egg on May 2. Twenty-three days had elapsed from the time the platform of a few sticks was discovered to the time the set of four eggs was laid.

INCUBATION

Incubation at this nest was started after the first egg was laid; in fact, long periods of time were spent at the nest before any eggs were present, presumably by the individual which laid them. The group of jays, probably the same individuals which took part in the building of the nest, did not loose interest in the structure but continued their visits often to the serious annoyance of the incubating bird. They would even alight on the edge of the nest, nudge its body, push it aside, and peer at the eggs intently and then fly away. On several occasions when the incubating bird resisted, it was vigorously attacked, and one time I saw one of the birds grasp the incubating bird by the beak, completely dislodge it from the nest, greatly ruffling its feathers, and then proceed to chase it from the vicinity of the nesting tree. Such violent behavior is difficult to interpret. Was the attacking bird a member of another clan or was it the mate, over-zealous in taking over its turn at incubating the eggs? I doubt the latter, for ordinarily the exchange of birds at the nest was not accompanied by such violence. In striking contrast I saw one of the jays deliver food to the bird on the nest without any indication of conflict. It is possible, in this complicated interrelationship where so many individuals are involved, that polygamy may be practiced, but of this I have no evidence. Neither could I be sure of the sexes of the birds which exchanged places at the nest. Perhaps banding the birds with colored celluloid bands so that each individual could be easily identified would throw light on this problem. All the birds observed incubating or feeding young were black-billed.

For the first several days these visits by several jays were continued, but as incubation progressed the other jays seemed to exhibit less interest in the nest and its contents. After ten days only two birds, presumably a male and female, were regularly seen at the nest. However, when the incubating bird was disturbed, as when I climbed the tree to examine the nest, her cries on leaving would summon a group of three or four and sometimes as many as six or seven individuals which would join in angry protests at the intrusion. Their cries and curious wing flutterings would continue until I retreated and the incubating bird returned to her nest.

The eggs were closely incubated, and almost every time I visited the nest, which was many times daily, an incubating bird would be present. When it was excessively hot, the bird would elevate its body well above the eggs and at times would rest on the brim of the nest shading the eggs from the direct rays of the sun. At such times its beak would be held widely open. At night as well as during the early morning and late afternoon the incubating bird was snuggled deep in the nest and only its long tail and the tip of its beak which extended over the edge of the nest could be seen when I stood on the ground beneath the tree.

The incubation period of the Mexican Jay is 18 days. A marked egg which was laid on April 11 hatched on April 29. In another nest the eggs were laid on May 2, 3, 4 and 5, respectively. Two of the eggs hatched on May 20, one on May 21 and the fourth on the morning of May 22.

The color of fresh unblown eggs is pale sulphate green (Ridgway, 1912, 39′d), entirely free of markings of any kind. This is a brighter and a more vivid color than glaucous green (Ridgway, 37″d) determined by Bendire (1895) and Niagara green (Ridgway, 41″b) by Bent (1946). Colors of dried blown eggs, obtained from various sources, which I have examined more nearly approach the colors determined by Bendire and Bent.

The numbers of eggs for complete sets found in Madera Canyon varied from three

to five. Contents of nests located were as follows: April 11, 5 eggs; May 2, 4 eggs; May 4, 4 eggs; May 5, 3 eggs; May 9, 5 eggs; May 14, 4 eggs; May 20, 3 eggs; May 24, 4 eggs; June 3, 3 eggs; June 3, 4 eggs; June 6, 4 eggs; June 9, 4 young.

Fig. 49. Mexican Jay incubating. Another jay is about to inspect the nest; June 5, 1948.

THE YOUNG

After the eggs hatched, only two adult birds were seen about the nest. Bands of jays were seen roving about the neighborhood but as far as I could determine no individuals other than the parents fed the young. There were four nests within close range, two not more than seventy-five feet distant, but each pair seemed independent of the others. However, in the event the birds were disturbed, the neighbors were quick to respond and to add their protests.

The young were brooded during the first week and were left alone only for short intervals when both adults might be away foraging for food, often in company with their neighbors. Both male and female shared equally in the tasks of feeding the young and were frequently seen at the nest together. Some of the food first delivered to the young was insect larvae, but as they grew older a great variety of food was offered. When the adults approached the nest with food, their calls brought an immediate response from the young. The rasping calls of the young were given continuously until the adult alighted on the brim of the nest to feed them. The calls of the young increased in intensity and changed in quality as they grew older.

The nest was kept perfectly clean, the excrement of the young being eaten or, when the young were older, carried away by the adults. After the young were two weeks old, they were not brooded during the day when normal temperatures prevailed. At night an adult was usually at the nest even when the young were in advanced stages of growth.

The growth of the young for the period spent in the nest is shown in the table of measurements taken of representative ages of 1, 3, 6, 10, 16, 20 and 24 days. Most of

the measurements are standard and need no explanation. The measurement toe-toe is taken from the tip of the toe nail of the hind toe (number one) to the tip of the nail of toe (number 3). The length of the tarsus is derived by subtracting the length of toe number 3 from the tarsus-toe measurement. These measurements, in centimeters, and the following brief descriptions will serve as an aid in determining the approximate age of any nestling of the race *Aphelocoma ultramarina arizonae*.

Age in days	1	3	6	10	16	20	24
Length	5.8	6.9	10.2	11.1	13.9	16.5	18.8
Tail	....	....	....	.7	1.3	2.3	3.1
Unsheathed portion of middle tail feather	....	....	....	....	.1	.9	1.2
Extent	5.2	5.9	9.1	14.7	20.3	29.5	33.3
Wing	.9	1.1	1.9	3.1	6.1	7.8	8.6
Fifth primary	....	....	.1	.9	3.1	5.1	6.2
Unsheathed portion of fifth primary	....	....	....	....	.2	1.5	2.8
Culmen	.7	.9	1.2	1.3	1.5	1.5	1.6
Bill from nostril	.3	.4	.7	.8	.9	1.1	1.2
Toe-toe	1.4	1.7	2.9	3.2	4.9	4.9	4.9
First toe	.6	.8	1.1	1.6	2.0	2.2	2.2
Third toe	.7	.9	2.0	2.1	2.2	2.4	2.4
Tarsus-toe	1.9	2.2	3.8	5.5	6.8	7.2	7.2

One day.—The young are naked without any natal down at the time of hatching. There is no external evidence of feather tracts, but along the manus there are raised spots of the integument marking the positions of the underlying papillae of the primaries and secondaries. The eyes are closed.

Six days.—The naked skin of the six-day old chick as well as that of younger stages varies from vinaceous tawny (Ridgway, 11″a) to pinkish vinaceous (Ridgway, 5″d). Some of the feather tracts are faintly indicated by papillae, but very few have as yet pierced the integument except those of the primaries and secondaries which are about ½ to 1 mm. in length. The fifth primary is 1 mm. in length.

Ten days.—The feather tracts of the body are well defined but the tracts of the head are only faintly suggested so that the head still appears naked. The tips of the papillae of the scapulars, spinal, femoral and ventral tracts are unsheathed. These tips are downy. Feather growth on the leg tracts is scant with little unsheathing at this stage. The papillae of the primaries and secondaries are 8 to 9 mm. in length but with sheaths intact. Eyes are open.

Fourteen days.—All tracts of feathers including those of the crown are well advanced and unsheathing is progressing rapidly. The tips of primaries and secondaries are unsheathed.

Sixteen days.—The growth and unsheathing of the feathers has advanced to a stage where there is a substantial covering of feathers. The unsheathed portions of the ventral tracts are a tawny white in color. Although the feathers of these tracts average 8 mm. in length, the ventral apterium is conspicuous when the bird is viewed from below. The sides of the head are naked, but a few feather papillae have appeared in the auricular region. The ear openings are still well exposed to view. Rictal feathers are prominent. Young at this age are able to support their heads in a sustained upright position.

Twenty days.—A nestling at the age of twenty days, when viewed from above, reveals no naked areas or apteria; these are well concealed by the grayish brown contour feathers. The ventral tracts are buffy white in color, but as yet the feathers have not grown sufficiently to conceal the large ventral apterium. The auricular region is feathered, and only a small area on the side of the head remains naked. The unsheathed portions of the remiges are bluish gray but some parts display a distinct blue color. The unsheathed tips of the rectrices are now 9 mm. in length. These tips are brown in color without any tint of blue. The tip of the bill is horn color but a dark area is present near the outer one-third of the maxilla. The base of the maxilla is of a flesh color and the posterior lateral extensions of the gape are pale yellow. The iris is dark slate in color. The bird of this age clings tenaciously with its claws to a twig or to one's finger.

Twenty-four days.—The juvenal plumage at this stage is well advanced and many of the tracts of feathers have completed their growth and unsheathing. The upper parts are grayish-brown or grayish slate in color. The outer vanes of the primaries are tinted distinctly with blue; the inner vanes are

fuscous. The under parts, including the under tail coverts, are white; the sides and flanks are tinged with buff. The throat is white, the upper breast, dusky. Tarsus and toes are light olive, the nails being darker. The mandibles are vinaceous horn color, the entire lower mandible having a reddish tint. The dark area present in the bill of a twenty-day old young has increased in extent and in degree of pigmentation. (The bill of the adults is entirely black, a condition usually not acquired until the bird is more than a year old. Most one-year-old birds have the basal portions a light horn color. See Pitelka, 1945:256).

The young at 24 or 25 days of age are able to leave the nest. At one nest the young left at the end of 24 days and at two nests they were 25 days of age at the time of leaving. At that age they can make short flights from limb to limb, but another week is required before they are capable of strong, sustained flights.

RELATIONS WITH OTHER BIRDS

Mention has already been made of the relation of the Mexican Jays to other birds at the feeding station at our camp. Their gregarious habits, so conspicuous during the winter months, are continued throughout the nesting season. Noisy garrulous bands of four or five to as many as a dozen or fifteen can be seen on any walk through the live oak belt of Madera Canyon.

A Mexican Jay when alone is extremely wary and suspicious, but when a member of a group, it becomes aggressive and ready to exploit any situation that may net it food or satisfy its tendency toward plunder. Often I have met with such groups in the lower part of Madera Canyon where other birds were under observation. On May 22, when I was in a blind observing a nest of a Solitary Vireo, a group of five jays appeared, one of them alighting on the oak branch on which the nest was placed. The disturbed vireo flew from the nest and called alarmedly. The cries of the bird brought the male vireo to the scene. The first jay had retreated, but the other four came in as a gang, resulting in a losing battle for the vireos until I left the blind to take sides in the contest. The next day when I visited the nest the eggs were gone. I suspected that the jays had made another visit in my absence and made off with the eggs.

Later in the season I saw one of a group of jays with a bird's egg in its beak. At another time a group of jays was seen causing a great commotion in a tree where there was a nest of half-grown Black-headed Grosbeaks which had been examined an hour or so before. After the jay's visit I again climbed the tree and found only one young present, circumstantial evidence that the jays were responsible. Jays may also have been responsible for the disappearance of eggs or young at several other nests kept under observation.

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Bowdoin College, Brunswich, Maine, March 12, 1949.

THE SEVENTY-FIVE PER CENT RULE FOR SUBSPECIES

By DEAN AMADON

Now that most species of birds have been described, avian taxonomists have turned their attention largely to the study of variation within the species. The adoption of trinomial names for subspecies was a direct and, in general, valuable result of this trend.

The usefulness of the subspecific concept decreases when subspecies are described on the basis of distinctions that prove to be either non-geographic or too slight to permit satisfactory separation of the populations in question from adjacent subspecies. Innumerable differences of opinion as to the validity of one or another subspecies cause the entire subject to be viewed with increasing dislike by non-taxonomists. Excessive splitting of subspecies may be, in the long run, equally obnoxious to the taxonomist. For example, gradual variation over a long distance (clines) is obscured by the recognition of numerous intermediate subspecies. Often minor variations have a discontinuous distribution within a species, so that too liberal application of names may result in illogical ranges and misunderstanding of the meaning of the variation. Lack (1946:63) found this to be true of the European robin and concluded: "One therefore begins to wonder whether subspecific trinomial terminology is not beginning to outlive its usefulness and validity. Certainly, in the case of *Erithacus rubecula*, it is both simpler and more accurate to describe subspecific variations in terms of geographical trends, and to omit altogether the tyranny of subspecific names." Despite these difficulties, it is unlikely that trinomials will soon be abandoned, or that they should be. Subspecific names, if conservatively used, call immediate attention to variation and incipient speciation.

Geographic variation may be so slight it can be demonstrated only by exhaustive statistical tests, or it may exceed the differences apparent between some full species. Any limit of differentiation set up for the recognition of subspecies must, therefore, be an arbitrary one. The most frequently mentioned of such criteria is the so-called "75 per cent" rule or convention. While I am uncertain who proposed this rule, it may have been the late Admiral H. Lynes who was one of its early advocates.

The 75 per cent rule has been interpreted in two quite different ways. This may be shown by the following table reproduced in part from a recent paper by Rand (1948) on the Spruce Grouse.

Table 1

Plumage type	I	II	III	IV	V	VI	VI-VII	VII	VII-VIII	VIII	IX
C. c. canadensis	0	0	1	6	5	10	14	25	3	6	0
C. c. osgoodi	0	0	0	0	0	0	2	0	6	6	1

Rand had 70 specimens of the population of *canadensis* and 15 specimens of *osgoodi* which he distributed among nine color categories (shown by Roman numerals) as indicated. The brownest birds are in class III; they become progressively grayer through class IX. Seventy-five per cent of a sample of 70 is 52.5. Beginning at the left, classes III-VII, indicated by the upper bracket, will include 75 per cent of this sample (classes I and II were set up for other populations not considered here). Similarly for *osgoodi* 11.2 specimens are 75 per cent of a sample of 15. Beginning at the right, 75 per cent of this sample fall in the last three classes (lower bracket). Since these 75 per cent segments of *canadensis* and *osgoodi* do not overlap, the brownest 75 per cent of *canadensis* are browner than the grayest 75 per cent of *osgoodi*, at least in these samples. Rand concluded that *osgoodi* is subspecifically distinct from *canadensis*. (He has since told me that he now would prefer a separation of about 90 per cent from 90 per cent.) This

method of separation by equal percentages does not tell us directly what part of any population can be individually identified. We do not know how far the 75 per cent segments thus separated are overlapped by the remaining 25 per cent segments.

The other method of applying the 75 per cent rule is to insist that 75 per cent of a population must be separable from all (100 per cent) of overlapping populations before granting subspecific status. For statistical reasons this is better expressed as 99+ per cent rather than 100 per cent (see beyond). Applying this method to table 1, it is

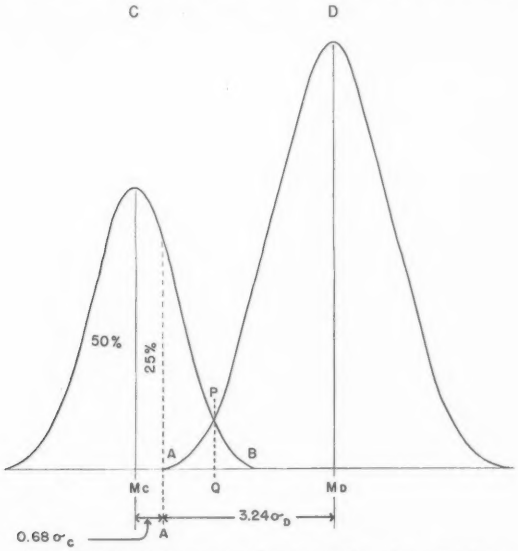

Fig. 50. Distribution curves for two series of overlapping measurements. For explanation see text.

evident that 22 of the 70 specimens of *canadensis* (31 per cent) and only 1 of the 15 specimens of *osgoodi* (7 per cent) are outside the limits of variation of the other population. According to the criterion of 75 per cent from 99+ per cent, *osgoodi* is far below the level of differentiation needed to separate it subspecifically from *canadensis*, if these samples are at all typical.

If smoothed distribution curves for two such series of overlapping measurements are drawn, the results will be similar to figure 50. A line P-Q drawn vertically through the point *P* where two such curves intersect gives the minimum overlap of the two upon each other. According to the first interpretation of the 75 per cent rule mentioned above, at least 75 per cent of one curve must be separable from 75 per cent of the other by this line of minimum overlap or, to state it conversely, maximum separation. The second interpretation demands that 75 per cent of each curve must be separable from 99+ per cent of the other as determined by upper or lower limits of the curves (see beyond), such as the points A and B of figure 50.

Either of these interpretations, as thus stated, might be adopted. Since the amount of differentiation necessary to give 75 per cent separation by the first is much less than by the second method (table 1 is an example of this) a choice between them must be made. A number of ornithologists, not all taxonomists, who were asked which of these

interpretations seems preferable, preferred the second, probably because it is logical to assume that a "75 per cent rule" means that 75 per cent of the individuals in a population are separable from (all) those in other populations.

Aside from statistical difficulties, which will be considered later, the second method (separation from 99+ per cent) can be used even if some lower figure such as 50 per cent from 99+ per cent were considered preferable. There are, however, a number of reasons for believing that 75 per cent from 99+ per cent is not too rigorous a criterion. Many subspecies, particularly those differing in a number of characters, or those of insular distribution have literally 100 per cent of their individuals separable. This is true even of many continental subspecies except in geographically intermediate areas of intergradation.

It must also be remembered that most taxonomic comparisons do not permit use of all the available specimens. Usually those in immature plumage as well as adults in worn or molting plumage must be eliminated. In some species, for example the spruce grouse of table 1, or certain South American ovenbirds, only the females vary to an appreciable extent geographically.

For one or another of these reasons, comparisons must often be limited to one-half or less of the available specimens. It seems reasonable to require that 75 per cent of the comparable specimens of a population be separable from substantially all (99+ per cent) of overlapping populations before a subspecific name is applied.

Although "75 per cent from 75 per cent" does not seem to set a high enough standard of differentiation for a subspecific criterion, this method of separation by equal percentages can be used more accurately when working directly with samples than can the method of "75 per cent from 99+ per cent." It is possible to achieve equal results by the two methods if the first is modified to "97 per cent from 97 per cent" which is roughly equivalent to "75 per cent from 99+ per cent." This may be demonstrated by the methods to be outlined, which involve the fact that any portion of the area of a normal distribution curve may be expressed as a multiple of its standard deviation.

A corollary of the preceding statements is that it is possible for 75 per cent of one population to be separable from 75 per cent of another when as little as 3 per cent of each population is separable from all (99+ per cent) of the other. In such cases only 6 per cent of the individuals in the combined populations (or specimens in the samples) could be positively identified as belonging to one or the other. This further emphasizes the great difference between the two interpretations of the 75 per cent rule.

In accordance with the foregoing conclusions, the 75 per cent rule will here be defined to mean that before a population is given subspecific status at least 75 per cent of the individuals comprising it must be separable from 99+ per cent of the individuals of all other populations of the same species which may overlap with it as regards the geographically variable characters. The overlap of the populations may be inferred either from the available samples directly or, preferably, by the use of normal distribution statistics applied to the samples. An equivalent statement is that 97 per cent of one of two compared populations must be separable from 97 per cent of the other. Methods of applying this rule will now be discussed. It is hoped that these methods will prove useful even if the degree of differentiation eventually accepted as most desirable for this purpose is not precisely that advocated here.

75 PER CENT FROM 99+ PER CENT

For direct work with samples it is necessary only to make a frequency distribution, such as table 1, and determine whether 75 per cent of the specimens can be identified. For example, 1 of 15 specimens of *osgoodi* (7 per cent) is grayer than any of the 70 speci-

mens of *canadensis*. Unfortunately such direct comparison of samples, unless very large ones are available, is too inaccurate to be acceptable. The limit or range of variation in such comparisons is based upon only two measurements in each sample—the two extremes. A single abnormal or freak measurement will have an entirely undeserved influence. Moreover, the range to be expected in a small sample is much less than in a large one or in the total population from which the sample was drawn. The range expected in a sample of 12, for example, is only one-half that to be expected in a sample of 1000 from the same population (Simpson, 1941:792). It is for these reasons that Simpson (*op. cit.*: 785) has described the observed range as " . . . probably the least reliable and enlightening of all available measures of variation."

In defining subspecies we seek the characters of the population and are interested in the sample only as a means of inferring these characters. It is almost always impossible to determine the range of variation of a particular measurement in the total population but by using the statistics of normal distribution we may estimate it. Simpson (1941) has proposed to use as such an estimate 6.48 times the standard deviation ($6.48\,\sigma$), that is, the mean plus or minus $3.24\,\sigma$ ($M \pm 3.24\,\sigma$). This sets up limits that will, on the average, include 999 of every 1000 measurements (99.9 per cent). The arguments for accepting this figure, which Simpson calls "standard range" he has listed in the publication cited.

Another set of limits that has been used sometimes is $M \pm 3\,\sigma$. About 1 measurement in 440 will fall outside limits thus established. Either of these limits would be adequate for present purposes; the use of $6.48\,\sigma$ will naturally set a slightly higher standard of differentiation for subspecies than will $6\,\sigma$. $6.48\,\sigma$ will be used here since Simpson has worked out the application of standard error to it in terms of 1 per cent points of the standard range. Simpson and Roe (1942) also have devised a standard frequency distribution method based upon standard range, including a number of tables giving various properties of normal distributions, often in terms of standard range. The most important of these to us is one permitting a quick estimate of the standard range from the observed range and sample size. This permits a rough application of the method now to be outlined without calculating the standard deviation from the sample. This need then only be done if the differentiation seems so close to 75 per cent as to require a comparison based on direct calculation of the standard deviation and the standard range from the sample. The use of standard range ($6.48\,\sigma$) thus places the present work on a more convenient basis for further analysis along the lines outlined by Simpson and Roe in the papers cited.

The standard range as determined above will not be much below the true range of variation of the population. In other words, if 1000 specimens are measured, the limits thus found will change very little and slowly if more are measured. It is necessary thus arbitrarily to establish limits of variation because the normal distribution curve, based as it is on the laws of chance, theoretically has no limits short of infinity. This is obviously not true of biological variates. To give a crude example, regardless of how many sparrows are measured, one the size of an eagle will never be found. The fact that the distribution curves of figure 50 are shown as meeting the base line may be considered a modification of the normal curve for biological studies.

As regards the use of standard ranges in calculating percentages of overlap, the simplest procedure is to calculate these ranges for two samples to be compared and then find what percentage of each sample lies outside the limits thus set up.

It is better, however, to find the percentage of overlap by further use of statistical methods. The procedure for this is as follows, using figure 50 as an example. $3.24\,\sigma_d$ subtracted from M_d fixes the point A, the lower limit of the standard range of curve D. The distance from A to the mean of curve C

is found ($A - M_c$) and divided by the standard deviation of C. Every such quotient $\frac{d}{\sigma}$ corresponds to a definite percentage of the area of the normal curve which may be determined from available tables (Simpson and Roe, 1939:137). Since 50 per cent of curve C is to the left of its mean, if 25 per cent or more lies between the mean of C and the lower limits of D (= point A), then 75 per cent of C will be separable from 99+ per cent of D. A value of $\frac{d}{\sigma}$ of 0.68 corresponds to 25 per cent of the area. Hence if the quotient is of this value or higher, the 75 per cent rule is satisfied.

If the purpose is merely to determine whether the percentage of a population separable by this method is 75 per cent or greater, it is not necessary to consult a table. Dr. J. A. Armstrong pointed out to me that the desired tests can be indicated by simple equations, as follows, retaining the designations of figure 50.

Given two samples C and D, of which C has the smaller mean for a given measurement, drawn from populations also designated as C and D, then at least 75 per cent of population C will lie below the lower limits of population D (as defined by the standard range) with respect to this measurement when

$$M_d - M_c = \text{or} > \quad 3.24\sigma_d + 0.68\,\sigma_c \qquad (1)$$

Similarly, at least 75 per cent of population D will exceed the upper limits of C for a particular measurement when

$$M_d - M_c = \text{or} > \quad 3.24\,\sigma_c + 0.68\,\sigma_d \qquad (2)$$

In practice two such overlapping series of measurements will rarely if ever have precisely the same standard deviations, first because the standard deviation is correlated with the magnitude of the measurement and will average larger in the population with larger measurements, second, because one of the populations will often be more variable than the other as regards a particular character. This affects the standard deviation and the relative percentages of two populations separable from one another. The more variable population will have a higher percentage of its individuals in the zone of overlap between the two.

The above considerations are of more theoretical than practical significance. Ginsburg (1938) has treated an essentially similar problem by taking the average of the two percentage separations (which in our case would be determined by using the above two formulas). In the rare instances where one but not the other of two compared populations is 75 per cent separable, it would perhaps be best to treat them as a single subspecies.

The standard deviation calculated from a sample will be a less accurate estimate of that of the population when the sample is small. This is reflected in the standard error of the standard deviation which varies inversely with the size of the sample. Although we are concerned with comparisons based indirectly on standard deviations, a "75 per cent rule" is at best an approximate test. Only when the samples compared are small and the differentiation near the 75 per cent limits, need the standard error be considered. The simplest method of so doing is to add to each standard deviation its standard error before finding the standard range. A more accurate method is by the determination of the one per cent points of the standard range as explained by Simpson (1941), but this refinement is perhaps never needed for our purposes.

When samples are too small to permit finding the standard deviation with reasonable accuracy (six or less measurements), the above methods can not be used. If one large and one small sample are available, the standard range of the former may be found and direct comparison employed to find if the small sample lies outside this range. If both samples are small, the naming of a new subspecies is scarcely to be considered unless the differentiation is great and encompasses many characters.

Often two populations differ in a number of variable characters no one of which provides 75 per cent separation as here used. The problem of determining whether such separation is achieved if all the characters are used in combination is difficult statistically. Various methods for "adding" characters, even when so refined as Fisher's discriminant function, do not directly tell us the percentages of two populations separable. Among the things affecting this are the variable degrees of correlation among the characters involved.

For present purposes, the best procedure would seem to be first to calculate the standard ranges for each character and then by direct comparison of samples to find how many and which specimens can be identified by each character. The number of specimens in each sample that can be identified by one character or another is then tallied and if it equals 75 per cent of the sample this can be considered as satisfying the rule. Since by this method each identifiable specimen is counted only once, although some of them may be capable of identification by more than one of the variable characters considered, the correlation of the characters will be reflected in the results, even though it is not separately calculated. This is not the case if statistical methods are used exclusively. The latter, for example, might indicate that 30 per cent of a sample are separable by wing length and 30 per cent by tail length. If these characters were perfectly correlated, the 30 per cent separable in each way would be comprised of exactly the same individuals; that is, separation would be no better by use of the two measurements than by either of them separately. Hence adding the two percentages to give 60 per cent separability would be quite erroneous. This pitfall is avoided by direct tallying of individuals as here recommended.

97 PER CENT FROM 97 PER CENT

Use of this alternative method is to be preferred when comparisons are limited to the actual samples and only one character is being considered. The procedure is similar to that used by Rand in table 1, except that 97 per cent (rather than 75 per cent) segments of the samples will be bracketed to see if they overlap. In terms of distribution curves this means that, on the average, only 3 measurements in 100 can lie on the "wrong" side of the line of best separation (P-Q in figure 50). Since we cannot subdivide measurements, in samples of 16 or less all must be separable in this way, in samples of 17 to 49 all but 1, etc. (97 per cent of 17 is 16.49).

The point where two overlapping normal curves intersect tends to have the same position, regardless of the size of the samples on which the particular curves are based. This is why the method of 97 per cent from 97 per cent can be used with reasonable accuracy in direct comparison of series of measurements. Even here, however, better results may be achieved by the use of statistics.

For exact statistical determination of the percentage of two curves separated by a vertical line through the point where the curves intersect it is necessary to locate this point. The formula for this proves to be so complicated as to make the use of this method impractical for ordinary purposes (for details of formula, see Klauber, 1943:56).

Although the exact location of the line of minimum overlap is thus too laborious to be a part of a convenient measure of separation, it is possible to estimate statistically whether 97 per cent of one curve is separable from 97 per cent of another. In curve C (figure 50) 50 per cent of the area is to the left of the mean. We wish to know whether an additional 47 per cent (97 per cent minus 50 per cent) lies between the mean and the line P-Q. Appropriate tables show that $1.88\,\sigma$ above (or below) the mean correspond to 47 per cent of the area of the normal curve. Hence we add $1.88\,\sigma$ to the mean of C and subtract $1.88\,\sigma$ from the mean of D. If these points just meet or do not meet then at least 97 per cent of the areas are separable. If the points overlap, less than 97 per cent separation is (usually) possible. This may be expressed by a formula as follows:

Given two samples, C and D, drawn from corresponding populations, then at least 97 per cent of populations C is separable from 97 per cent of population D by a given measurement when

$$M_c + 1.88\,\sigma_c = \text{or} < M_d - 1.88\,\sigma_d \qquad (3)$$

Even if the two points as thus determined coincide with each other, they will not coincide with the point of intersection of the curves unless the standard deviations of the two are identical, a con-

dition that will never be met precisely. This method might indicate that 97 per cent segments of two curves were not separable when, if the line P-Q were located exactly by use of the above-mentioned equation, they would be found separable. Since, however, we are concerned with the comparison of the same measurement in closely related populations, probably the standard deviations will rarely differ enough to introduce serious error. If the use of formula (3) indicated separation just short of the required 97 per cent, the alternative method (formulas 2 and 3) which takes into account the different values of the two standard deviations may be used.

Hubbs and Perlmutter (1942) have proposed a method essentially similar to that of formula 3 but they use 1 σ above and below the mean, instead of 1.88 σ. This measures a degree of differentiation too low, in my opinion, for subspecific separation. They suggest a method of graphic comparison that is useful in studies of this kind. Ginsburg (1938, 1940) has also discussed methods involving estimates of the percentages of two populations separable in this manner. He was working with discontinuous variates such as ray counts in fish; a type of variation rarely encountered in studies of geographic variation in birds. Moreover, Ginsburg limits himself entirely to the direct comparison of samples and does not consider the more accurate results possible by the use of the statistics of normal distribution.

The foregoing methods all assume that the variable characters in question have an essentially normal distribution. This is usually true; if it is not, the construction of frequency distribution tables or histograms will make this evident. Simpson and Roe (1942) have given careful consideration to this question in their standard frequency distribution method.

The comparison of variation in color, so frequent in work with birds, can utilize the above statistical formulas if it is possible to group the specimens into a number of numerical color categories such as those of table 1. The mean and standard deviation can then be found. If this is not feasible, it is still possible to arrange the specimens in a rough sequence according to color and then to estimate whether 97 per cent of the specimens in one of the samples is separable from 97 per cent of those in the other.

EXAMPLE

Use of the formulas will be illustrated by analyzing wing lengths of Turkey Vultures (*Cathartes aura*). This example is not ideal in as much as in one instance the differentiation is well above and in the other well below the required 75 per cent from 99 per cent, but the material will serve to show the use of the formulas and the relation between observed and standard ranges.

The three currently recognized races of Turkey Vulture in North America are: (1) *C. a. aura*, West Indies and Panamá north to the Mexican-United States border, including the Brownsville area of Texas. (2) *C. a. teter*, western United States and southwestern Canada. (3) *C. a. septentrionalis*, eastern United States (except Florida) and southeastern Canada.

Friedmann (1933) described *teter* as having a long tail like *septentrionalis* but short wings like *aura*. After calculating the tail to wing ratio in the specimens tabulated here, it was evident that, while there is a slight tendency for the values of this ratio to be higher in larger individual specimens or in populations made up of larger individuals, the overlap is tremendous. This variation is of little or no help in defining subspecies. The series of *aura* measured by Friedmann showed a range of variation of only 15 millimeters in tail length as compared with twice that in the two other populations. This difference did not exist in the specimens measured by me. It would seem that this sampling accident is responsible for much of the over-emphasis upon variation in proportions in this species.

Geographical variation in color of plumage or soft parts in the North American Turkey Vultures also awaits confirmation. Variation seems to be chiefly in general size of which wing length is the best available measure.

Measurements given in table 2 were taken by the writer at New York and at Cambridge (courtesy Mr. J. L. Peters). Dr. A. R. Phillips sent me measurements of Arizona specimens. Measurements in the literature published in form that permitted calculation of the standard deviation were also used; such sources are marked with an asterisk in the literature cited.

Table 2

Wing Length (chord) of *Cathartes aura* in Millimeters

Population	Number of specimens	Observed range	Standard range (grouped about mean)	Mean	Standard deviation
aura	23	470-505	463-517	490	8.22
teter	11	486-520	470-538	504	10.53
septentrionalis	14	530-557	523-571	547	7.55

Since *teter* is the intermediate population as well as the last one to be named, it is best to find whether 75 per cent of this group is separable from each of the other two. Using formula 1 to determine whether 75 per cent of *teter* are below the lower limits of *septentrionalis* in wing length:

$$547 - 504 = \text{or} > 3.24\,(7.55) + 0.68\,(10.53)$$
$$43 = \text{or} > 24.5 + 7.2$$
$$43 > 32$$

As the left member is greater, more than 75 per cent of *teter* are thus separable from *septentrionalis*.

To determine what this percentage actually is, the deviation between the lower limit of the standard range of *septentrionalis* (523) and the mean of *teter* (504) is found (19) and divided by the standard deviation of *teter* (10.53). This quotient (1.8) is equivalent to 46 per cent of the area of the curve (above the mean). When added to the 50 per cent below the mean it indicates that 96 per cent of the population *teter* will have shorter wings than the shortest winged *septentrionalis*. It is not surprising that no overlap in this measurement was found in the relatively few specimens measured.

By using equation 2 it may be shown that 89 per cent of *septentrionalis* will exceed the upper limits of *teter* in wing length. *Teter* is a somewhat more variable, intermediate population with a higher standard deviation than *septentrionalis*. This is why only 89 per cent of the latter is separable from *teter*, while 96 per cent of *teter* is separable from *septentrionalis*.

Formula 2 may also be used to determine what percentage of *teter* may be expected to exceed the upper limits of *aura* in wing length. Since the upper limit of the standard range of *aura* (517) is above the mean of *teter* (504), it is less than 50 per cent. The deviation is 13 (517 — 504); this divided by the standard deviation of *teter* is 1.2, which corresponds to 38 per cent of the area of the curve. All those *teter* with wing length below the mean (50 per cent) and 38 per cent of those above the mean are overlapped by *aura*. This leaves only the 12 per cent with longest wing length that can be separated from *aura* by this measurement. Hence *teter* would appear a synonym of *aura*, the trend toward larger size upon which it is based being too slight for subspecific recognition.

The use of formula 3, to see if 97 per cent of *septentrionalis* is separable from a like percentage of *teter* is as follows:

$$504 + 1.88\,(10.53) = \text{or} < 547 - 1.88\,(7.55)$$
$$524 < 533$$

Hence more than 97 per cent of either population is separable from 97 per cent of the other. Similarly it may be shown that less than 97 per cent of *aura* is separable from *teter*.

Several individuals have given me helpful advice during the preparation of this paper, in particular Drs. J. A. Armstrong, E. Mayr and A. L. Rand.

SUMMARY

Frequent disagreement as to the validity of one or another subspecies of bird makes it desirable to establish a criterion of differentiation that must be met before a population is named or recognized as a subspecies. One such standard, already in partial use though with frequent ambiguities, is the 75 per cent rule. This is here defined to mean that 75 per cent of a population must be separable from all (99+ per cent) of the members of overlapping populations to qualify as a subspecies. An equivalent statement is that 97 per cent of one of two overlapping populations must be separable from 97 per cent of the other. This expression of the rule, 97 per cent from 97 per cent, is more accurate than the other when comparisons are based directly on specimens (or their measurements) and do not involve use of normal curve statistics.

Better results, and with relatively little labor, may be achieved by the use of such statistical methods. For this purpose either 75 per cent from 99+ per cent or 97 per cent from 97 per cent may be used, with the former perhaps preferable. Formulas for using either method are given. Related problems are discussed and an example is given. It is hoped that the methods proposed will prove useful even if the exact degree of differentiation here advocated is modified.

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VALIDITY OF THE SHOREBIRD GENUS PSEUDOSCOLOPAX

By GEORGE MIKSCH SUTTON

While preparing the ornithological material for the forthcoming Encyclopedia Arctica, I recently have had occasion to examine specimens of numerous Asiatic birds. One of the most interesting and puzzling of these is the so-called Snipe-billed Godwit, a species Peters has listed as *Limnodromus semipalmatus*. I have not seen this bird alive, of course, but I have examined several specimens borrowed from the Museum of Comparative Zoology and the American Museum of Natural History, and I have come to believe that it belongs neither in *Limnodromus* nor in *Limosa*, but in a genus by itself. Frank A. Pitelka has expressed substantially the same belief in a recent paper (Condor, 50, 1948:259-269). Although there he has actually left *semipalmatus* in the genus *Limnodromus*, he mentions the availability of the name *Pseudoscolopax* Blyth.

The significant part of Blyth's description (Jour. Asiatic Soc. Bengal, 28, 1859:280) of *Pseudoscolopax* reads thus: "It [*Pseudoscolopax semipalmatus*] is a much larger bird than *M* [*acrorhamphus*]. *griseus*, with a proportionately longer and still more thoroughly Snipe-like bill, while the semi-palmation of the toes at once distinguishes it. The plumage, too, is very different, and in our Indian bird considerably resembles that of most Ruffs in winter dress: the rump is uniformly coloured with the back; whereas the other has a pure white rump, becoming gradually more mottled to the upper tail-coverts; and the Indian bird is almost wholly white under the wings, where the other has every feather mottled with dusky."

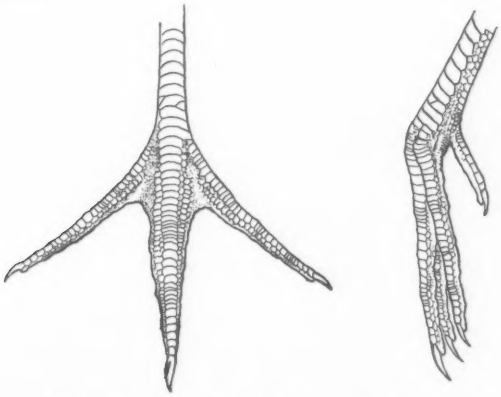

Fig. 51. Feet of *Pseudoscolopax semipalmatus*, life size.

The aforementioned sempalmation, which has been described by Pitelka, I have studied with care. In making the drawing reproduced herewith I relaxed and spread the toes of a male specimen collected by A. S. Loukashkin in the Heilungkiang Province of northern Manchuria (Am. Mus. Nat. Hist. no. 387945). As I examined the feet of this specimen, I became aware of the fact that the hallux was proportionately longer and heavier than in the New World dowitchers. In all eight specimens of the Snipe-billed Godwit I have thus far examined it reaches very nearly to, quite to, or slightly beyond the distal end of the proximal phalanx of the outer front (fourth) toe in the closed foot

and almost or quite to the distal end of the proximal phalanx of the inner front (second) toe. In only a very few of the numerous dowitcher specimens before me does the hallux reach to the distal end of the proximal phalanx of the fourth toe, and in none of them does it come at all close to reaching the distal end of the proximal phalanx of the second toe. In *Limnodromus griseus* the hallux is very slender. Exact measurement of toe-thickness in dried specimens seems to be impracticable, but careful comparison reveals that in the Snipe-billed Godwit the hallux is about half as thick as the other toes, while in the dowitchers it is about a third as thick as the other toes. This heaviness of the hallux is, I believe, correlated with the semipalmate condition. Whatever habitat factors have favored, through selection, development of the semipalmate condition have also favored bigness of hind toe. A guess may be hazarded that the bird habitually feeds in mud so deep that the semipalmation and thickness of toes are advantageous.

So far as I know, no one has called attention to certain ways in which the bill of the Snipe-billed Godwit is peculiar. The nostril is proportionately narrower than in *Limnodromus griseus*, being slit-like in six of the seven specimens at hand. It is also, again proportionately, farther removed from the frontal feathering. Oddly enough, in the only specimen before me which has an elliptical rather than a slit-like nostril, the proximal end of the nostril is only 3 mm. removed from the closest feathers, while in the other specimens it is 4 to 6 mm. away. In *Limnodromus griseus* the nostril is at the very base of the bill, the proximal end of the opening being a little more than 1 mm. (never more than 2 mm.) from the frontal feathering.

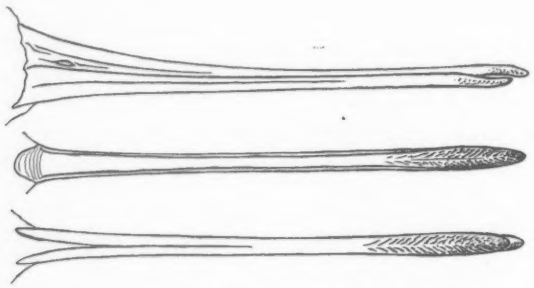

Fig. 52. Bill of *Pseudoscolopax semipalmatus*, life size, viewed from side, above, and below.

Whether the upper mandible fits down into the lower mandible in living Snipe-billed Godwits as it does in skins remains to be ascertained. In the specimen on which my drawing is based I did not become aware of this "troughing" of the lower mandible until I pried the mandibles apart. My reason for prying them apart was that I was puzzled by the closeness of the nostril to the commissure. There is, admittedly, much variation in bill-condition in the small series at hand. In the one juvenal specimen the bill was so forced out of shape by being tied shut during the course of preparation that its characters are obscure. In all the others the outer edges of the bill, when viewed directly from above, are the edges of the lower, *not the upper*, mandible, except at the very tip, where the upper mandible broadens. In all but one of the six adult specimens at hand the upper mandible fits definitely down into the lower to such an extent that pressing the two together instantly reveals the relationship. This "troughing" may also be characteristic of *Limnodromus griseus*, but probably to a lesser degree.

Blyth, who probably did not have a specimen of *Limnodromus griseus scolopaceus* before him when he described *Pseudoscolopax,* was in error in believing that *Pseudoscolopax* had a "proportionately longer" bill than *Limnodromus.* The proportions of *Pseudoscolopax semipalmatus* and *Limnodromus griseus scolopaceus* are about the same except for the position and shape of the nostril and the thickness and length of the hallux, as already described.

My thinking concerning the validity of *Pseudoscolopax* has, admittedly, been influenced by what we know of the present-day distribution of the forms involved in our discussion. As Pitelka has pointed out, the Snipe-billed Godwit breeds farther east in Asia than has been supposed. Furthermore, northeastern Siberian records of the Long-billed Dowitcher suggest that that form may yet be found breeding there. Thus, the geographical gap between the Old and New World forms is not actually very great.

Museum of Zoology, University of Michigan, Ann Arbor, Michigan, June 28, 1949.

RECENT NOTES FROM THE LOWER COLORADO RIVER VALLEY OF ARIZONA AND CALIFORNIA

By GALE MONSON

From May, 1943, to February, 1944, and from April, 1946, to the present time (August, 1948) my residence has been in the middle section of the lower Colorado River valley in Arizona and California. In these periods, I have been able to obtain a number or ornithological records that I feel are of sufficient value to report.

The middle section of the Colorado valley to which I refer extends from the city of Needles, California, on the north to a few miles below the town of Parker, Arizona, on the south. The section can be divided into three parts: (1) Havasu Lake National Wildlife Refuge, which lies along the Colorado River from near Needles on the north to Parker Dam on the south. It consists, in turn, of four divisions: the flooded cattail, sandbar, and dead brush swampland between Needles and Topock, Arizona; the constricted river (Mohave Canyon) between Topock and Havasu Lake; Havasu Lake itself; and the Bill Williams Delta (confluence of Bill Williams River and Havasu Lake just above Parker Dam). (2) The Colorado River between Parker Dam and Parker, bordered by a narrow strip of undeveloped riparian brushland, and including Headgate Rock Dam, a diversion structure watering the Colorado River Indian Reservation. (3) The Colorado River Indian Reservation, below Parker, mainly on the Arizona side of the river. The reservation contains a considerable acreage of cultivated farmland and also many square miles of brush and some woodland.

This paper adds several species to the Arizona state list, mentions inland records for pelagic birds, extends the breeding range of sundry species, and includes a number of unseasonal occurrences.

Gavia stellata. Red-throated Loon. A subadult was seen near Whipple Point on the lower part of Havasu Lake on June 8, 1948. What was very likely the same individual was seen near Needles Landing on the west side of Havasu Lake on June 15, 1948. I had the bird under protracted observation on both dates and carefully noted the shape of the bill, so I feel there is no doubt attached to the observation. This forms the first summer record of the species for Arizona as well as for the lower Colorado River valley. An earlier observation was made at Fort Mohave, Arizona, on November 21, 1947, when one was closely observed by Warren Pulich of Phoenix, Arizona. These are apparently the only valid records for Arizona.

Colymbus auritus. Horned Grebe. One was seen in the Bill Williams arm of Havasu Lake on April 19, 1948, in company with a flock of Eared Grebes (*Colymbus nigricollis*). This is apparently the first valid Arizona record.

Pelecanus occidentalis. Brown Pelican. Apparently of rare occurrence along the Colorado River. One immature was seen near Needles Landing on September 1 and 12, 1943; another was seen in the Bill Williams Delta on August 8, 1946.

Butorides virescens. Green Heron. One was seen in the Bill Williams Delta on December 7, 1946, a first wintering record for the lower Colorado valley above the Yuma district.

Ixobrychus exilis hesperis. Least Bittern. That the Least Bittern occasionally winters in the lower Colorado valley is evidenced by a male taken on the Arizona side about 1½ miles above Topock in a muskrat trap on December 13, 1943.

Anser albifrons. White-fronted Goose. One seen above Topock (Beal Slough) on May 10, 1947, is my sole spring record of a bird that migrates regularly through the valley in the fall.

Chen hyperborea. Snow Goose. Apparently a few individuals of this species come south well ahead of the main flight, which usually takes place in late November. I saw two at Icehouse Bend below Needles on October 1, 1943, a flock of five about a mile and a half below Topock on October 6, 1947, and a flock of three at Icehouse Bend on October 6, 1943.

Mareca penelope. European Widgeon. A male was observed on the California side at "568," just above Topock, December 16, 1947, and again on December 17 and 18. On the latter date it flew across

the state line into Arizona, creating a first record for that state. This individual was also seen by Pulich.

Aix sponsa. Wood Duck. A male was seen on June 7, 1946, below Devil's Elbow, in Mohave Canyon, a date that must be very unusual.

Buteo lagopus. American Rough-legged Hawk. One was seen above Topock on November 19, 1946, on the Arizona side, and again on November 23, 1946, on the California side. One was also noted in the Bill Williams arm of Havasu Lake on December 20, 1947.

Urubitinga anthracina. Mexican Black Hawk. One was seen on August 25, 1946, on the Colorado River Indian Reservation several miles south of Parker. It was perched in a roadside tree, watching a Road-runner (*Geococcyx californianus*) and a bull snake cross the road. The Road-runner was "convoying" the snake, walking ahead of the slowly moving four-foot reptile, apparently interested in it but not to the point of attacking it. The little drama was over when bird and snake disappeared into the dense arrowweed along the road. The hawk watched the proceedings in uninterested fashion, made no attempt to interfere, and then flew off at my closer approach. This is the first record of a Mexican Black Hawk for the lower Colorado valley as well as the westernmost record for the species.

Haliaeetus leucocephalus. Bald Eagle. An adult was seen on the Arizona side of Havasu Lake opposite Needles Landing on December 3, 1943, the first record for the lower Colorado River.

Rallus longirostris. Clapper Rail. This species was first met with on June 6, 1948, when an adult was seen at a seepage pond just above the California side of Headgate Rock Dam. Later, at the same place, on July 9, 1948, in company with Sid Platford of Los Angeles, I saw an adult and three small young. On July 17, 1948, I saw the young and two adults. There are no other records for this rail above Laguna Dam, some 100 air miles southward.

Charadrius alexandrinus nivosus. Snowy Plover. One was taken in the Bill Williams Delta on September 7, 1943, the first Arizona specimen. The species appears to be a regular, although uncommon, transient along the Colorado River, where I have records extending from March 30, 1947, to May 27, 1946, and in the fall, from July 13, 1948, to early November.

Eupoda montana. Mountain Plover. Two were seen along U. S. Highway 66 four and one-half miles south of Needles on October 26, 1943; this is my only record for the area.

Arenaria melanocephala. Black Turnstone. One was seen on May 21, 1948, at Needles Landing, forming one of the few inland records for the species and the first for the Colorado valley. It was quite tame, perfectly identifiable and characteristic of action, even to its flipping over a few stones and alighting on a bulkhead.

Numenius phaeopus. Hudsonian Curlew. One was seen on September 15, 1946, along the Colorado River about three miles northeast of Parker. One, possibly the same individual, was collected in the Bill Williams Delta on September 17, 1946, the first specimen obtained in Arizona.

Erolia melanotos. Pectoral Sandpiper. One was taken from a group of three in the Bill Williams Delta on September 17, 1946, the first specimen known from western Arizona. As many as 24 were seen subsequently on one date (September 14, 1947).

Erolia alpina pacifica. Red-backed Sandpiper. A specimen was taken in the Bill Williams Delta on November 24, 1947. Another was seen just above Topock on December 10, 1943. There are no previous records for western Arizona.

Limnodromus griseus. Dowitcher. Two, still quite buff-colored, were seen in the Bill Williams Delta on July 15, 1943.

Crocethia alba. Sanderling. Not previously reported from Arizona. One was seen in the Bill Williams Delta on September 6, 1943; one was seen just above Topock on September 17, 1947; and one taken and two others were seen on the Arizona side of Havasu Lake a few miles above Parker Dam on September 18, 1947.

Recurvirostra americana. Avocet. One was seen at Topock on December 7, 1947, the first winter record for Arizona. The same winter, in the Bill Williams Delta, five were seen on December 20, 1947, and six on January 16, 1948.

Stercorarius parasiticus. Parasitic Jaeger. An immature male was taken in the Bill Williams Delta on October 13, 1947, the first specimen taken in Arizona.

Larus occidentalis. Western Gull. One collected on the Arizona side at Parker Dam on December 12, 1946, the first specimen of the species for the state, was identified by A. J. van Rossem as *L. o. occidentalis*.

Larus argentatus. Herring Gull. One was collected on the Arizona side of Havasu Lake about one and one-half miles above Parker Dam on December 13, 1946. The specimen was identified by van Rossem as *L. a. thayeri*, having the following measurements: wing (chord), 396 mm.; total culmen, 53.5 mm. This is the first specimen of *thayeri* for Arizona.

Larus pipixcan. Franklin Gull. One observed on Havasu Lake near Pittsburg Point on October 2, 1947, is the first definite Arizona record. One was also seen in the same locality on April 13, 14 and 15, 1948.

Larus heermanni. Heermann Gull. An adult was seen at Needles Landing on July 13, 1948, the second truly inland record for the United States.

Columbigallina passerina. Ground Dove. Northern records in the Colorado valley area are: one seen at Topock on August 15, 1946; one seen at the mouth of Whipple Wash, about ten miles above Parker Dam on the California side of Havasu Lake on July 28, 1943; and one seen on the Colorado River Indian Reservation on November 27, 1947.

Scardafella inca. Inca Dove. A small colony is present at the Colorado River Indian Agency at Parker, just across the river from California. This is further evidence that the species is extending its range to include suitable habitat along the Colorado River. It was first noted on July 18, 1946, when one was seen. Maximum numbers seen on any one date were nine (November 2, 1947).

Asyndesmus lewis. Lewis Woodpecker. One was seen on October 13, 1946, on the Colorado River Indian Reservation below Parker. Others were seen at later dates, with a maximum of four seen on November 3, 1946; the last was seen on January 25, 1947. One was also seen on November 11, 1947. These form the only records for the lower Colorado valley.

Tyrannus melancholicus. Tropical Kingbird. One was seen at Beal Slough, above Topock, and on the Arizona-California state line, October 1, 1947. I thought at first it was an unusually late Arkansas Kingbird (*Tyrannus verticalis*), but upon observing the white throat, greenish back, lack of white on a not-black tail, the yellow-orange on the belly, the gray crown, and large black bill, I knew it was *melancholicus*, which I have previously observed in the vicinity of Tucson, Arizona.

Myiarchus tyrannulus magister. Arizona Crested Flycatcher. One was seen on July 28, 1946, on the Colorado River Indian Reservation about two miles south of Parker. One was collected there on August 11, 1946, one was seen on May 19, 1947, and others have been noted subsequently. I have also noted it occasionally in the Bill Williams Delta, including a male taken on July 23, 1948. There is but one previous record from the Colorado Valley, at Bard, Imperial County, in California; and it is not known to breed nearer than the Big Sandy Valley in Mohave County, Arizona.

Tachycineta thalassina. Violet-green Swallow. To my knowledge, there are no records of this swallow's breeding in the United States at any distance below the Upper Sonoran Zone. The existence of a small breeding colony on the cliffs just below Parker Dam, California side, is therefore of interest. I first noted this colony on May 7, 1946. It makes use of the Bill Williams Delta as feeding grounds. There, on May 25, 1947, and again on June 6, 1948, I took juvenal specimens not long out of the nest. An adult male was taken on April 29, 1948, which on examination appears to belong to the race *lepida*. I also suspect the existence of a breeding colony at Copper Basin Reservoir, in the Whipple Mountains near Parker Dam, but I have been unable to confirm this.

Iridoprocne bicolor. Tree Swallow. Two were observed at Beal Lake above Topock on June 18, 1948. At this late date, I feel they must have been summering individuals, a very unusual status for this hot Lower Sonoran territory.

Stelgidopteryx ruficollis. Rough-winged Swallow. One seen at Parker Dam on October 23, 1947, is an unusually late fall record.

Aphelocoma coerulescens. Scrub Jay. One seen in the Bill Williams Delta on May 25, 1947, is an extremely late record for a Lower Sonoran locality. Specimens were taken in the area in the fall and early winter of 1946 near Parker Dam, in the Bill Williams Delta, and near Parker.

Corvus brachyrhynchos. Crow. Eight were seen with a flock of ten Ravens (*Corvus corax*) on the Colorado River Indian Reservation on December 14, 1947. This flock apparently wintered; in the same locality, six were seen by Pulich and me on February 7, 1948, and three again by me on March 4, 1948.

Sitta canadensis. Red-breasted Nuthatch. One seen in the Bill Williams Delta on September 26, 1947, and another at Topock on September 30, 1947, are the only recent records for the valley.

Thryomanes bewickii. Bewick Wren. One was observed singing *sotto voce* at the mouth of Osborne Wash above Parker on August 4, 1946, apparently a very early fall arrival date.

Turdus migratorius. Robin. Three were seen in some mistletoe-infested mesquites on the Colorado River Indian Reservation below Parker on May 1, 1948; this is a very late date for this species.

Hylocichla ustulata. Swainson Thrush. One seen on the California side at Devil's Elbow on June 7, 1946, was a very late migrant.

Myadestes townsendi. Townsend Solitaire. Two were seen in the Bill Williams Delta on October 11, 1946; this is my only record for the Colorado valley.

Anthus spinoletta. Water Pipit. One seen at Needles Landing on May 9, 1947, is an unusually late spring record.

Vermivora virginiae. Virginia Warbler. An adult female was taken at Topock on July 23, 1946, a first record for the lower Colorado River and very early.

Oporornis tolmiei. Macgillivray Warbler. One male was seen on the Colorado River Indian Reservation near Parker on August 11, 1946; this is an early arrival date.

Icterus bullockii parvus. Bullock Oriole. An adult male was seen in a date palm-pecan grove on the Colorado River Indian Reservation near Parker on January 1, 1947, and was subsequently collected on February 1, 1947, to form the first winter record of the species for Arizona.

Euphagus cyanocephalus. Brewer Blackbird. A female collected at Needles Landing on June 12, 1947, is an unusual summer record.

Piranga rubra. Summer Tanager. A female was seen at old Beal station about six miles south of Needles, in athel trees, on January 21, 1944, by Frank B. McMurry of the Fish and Wildlife Service and myself.

Richmondena cardinalis superba. Cardinal. The native occurrence of this bird in California has been reported by van Rossem (Condor, 48, 1946:248). I first saw one in California, a bright male, on May 21, 1943, about two miles north of Crossroads, San Bernardino County, where it was feeding along the road on bread thrown from a passing car. This represents the first definite record for California. Since then I have frequently noted it in the vicinity of Parker Dam; on July 29, 1943, August 25, 1943, September 7, 1943, November 23, 1943, May 29, 1946, and July 12, 1948, in the Bill Williams Delta; and on various occasions along the Arizona side of the river between Parker and Parker Dam including one seen in Parker on April 11, 1946, one collected at the mouth of Osborne Wash on July 6, 1946, and one collected (from a pair) at Cienega Springs on December 4, 1946.

Pheucticus melanocephalus. Black-headed Grosbeak. One male seen in the Bill Williams Delta on July 2, 1947, was an unusually early returning migrant.

Carpodacus purpureus. Purple Finch. A flock of seven, four in male and three in female plumage, was observed at Parker Dam on November 26, 1947, my only record for the valley.

Spinus tristis. American Goldfinch. A female was collected on the Colorado River Indian Reservation near Parker on May 17, 1948, a very late spring date for the species. It has been identified by Alden H. Miller as *S. t. salicamans* and is the first record of the subspecies for Arizona.

Ammodramus savannarum. Grasshopper Sparrow. An immature was taken in the Bill Williams Delta on September 26, 1947, the first record for the valley since 1854.

Pooecetes gramineus. Vesper Sparrow. One seen on the California side at Parker Dam on May 20, 1946, was a very late migrant.

Junco caniceps. Gray-headed Junco. An immature male was collected one and one-half miles north of Topock on October 15, 1946, the first record for the Colorado valley, aside from a possible reference by Huey (Condor, 28, 1926:44).

Spizella breweri. Brewer Sparrow. One seen on the California side at Parker Dam on May 20, 1946, was a late migrant.

Fish and Wildlife Service, Parker, Arizona, October 25, 1948.

A COMBINED EARLY RECORD OF DUCK SHOOTING ON THE SUISUN MARSHES OF CALIFORNIA

By EMERSON A. STONER

In 1947 the late M. Hall McAllister, veteran duck shooter on the Suisun Marshes, Solano County, California, informed me that the record book of the old Cordelia Club of that area was still extant, although it had been reported destroyed by a fire. The book was kindly loaned to me by him.

The Cordelia Club was organized in 1880; however, no record of shooting was started until the record book was printed in 1882. The club adjoined the Ibis and Teal clubs (see Stoner, Condor, 36, 1934:105, map). Its property consisted of six hundred and forty acres lying between one and two miles west of Teal Station on the Southern Pacific Railroad. Both the Frank Horan Slough and the Cordelia Slough traversed the Cordelia Club whose grounds embraced what was known as the "string of ponds," ranging in area from one to ten acres, the largest being called the Hayward. These ponds ranged in depth from about four to six feet.

The record book covers the twenty-one hunting seasons from September 29, 1883, to February 11, 1904. Membership in the club was consistently limited to 10 at any one time. The total kill of each season ran from 1406 birds (1884-1885) to 4930 (1902-1903), averaging about 3200 birds per season. Seasons opened about the first of October and extended to the middle or end of February.

During the twenty-one year period a total of 64,872 ducks and 2616 geese were recorded as killed. Swans totaled 161.

	Number of birds	Percentages
Sprig	20,107	31.0
Green-winged Teal	12,064	18.6
Canvasback	10,079	15.5
Widgeon	9,689	14.9
Mallard	2,120	3.3
Gadwall	150	.2
Cinnamon Teal	99	.1
Redhead	77	.1
Spoonbill, bluebill, etc.	10,487	16.3

The total geese killed were:

White	2,496
Gray	72
Canada	28
Brant	20

The record indicates that Canvasbacks usually arrived on the marsh in the latter part of October (earliest date, October 11, 1891), becoming common in November, December and January and diminishing in February. The other species of ducks were on the marsh with the beginning of the hunting season. The dates on which the Whistling Swans were taken indicate the wintering season for this species on the Suisun Marshes, ten being taken in November (earliest, November 16), fifty-seven in December, eighty in January and fourteen in February (latest, February 18).

During the early days, the four largest and most important clubs on the Suisun Marshes were the Cordelia, Ibis, Tule-Belle and Teal clubs. The Teal Club, McAllister advised, had a fine book, beginning the first season, 1882-1883, with 4444 ducks and geese. This book was unfortunately burned in the San Francisco fire of April, 1906.

The total kill of 20,844 ducks on the Tule-Belle Club between 1885 and 1901 (Stoner, 1934, *op. cit.*), and 36,126 ducks at the Ibis Club between 1882 and 1907 (Stoner, Condor, 39, 1937:242-248), added to the kill of the Cordelia Shooting Club of 64,872 ducks between 1883 and 1904 presents a record of 121,842 ducks killed on these marshes. A tabulation of the kill of all three clubs gives the following:

	Total ducks	Percentage
Sprig	36,021	29.56
Widgeon	23,762	19.5
Teal	21,925	18.0
Canvasback	18,568	15.24
Mallard	4,915	4.03
Other ducks	16,651	13.67

The thought, of course, occurs that hunters may have "picked" their ducks by awaiting the arrival before their blinds of the more desirable species. In this connection, Moffitt (Condor, 40, 1938:76-84) states that "when there was no bag limit prior to 1901 in California gunners were not so selective of their game as later and tended to shoot almost any duck that flew by." McAllister concurred in this statement.

Benicia, California, August 22, 1947.

FROM FIELD AND STUDY

Report on the Colonial Nesting Birds of Great Salt Lake, 1947-49.—Several small islands in Great Salt Lake have long been known to afford sites for some of the largest colonies of White Pelicans (*Pelecanus erythrorhynchos*) and California Gulls (*Larus californicus*) in western North America. A survey was made of these islands and their colonies in 1932 (Condor, 37, 1935:24-35). Since then the pelicans have undergone considerable fluctuation in numbers and population shifts have been occurring with respect to the California Gulls which seem likely to have a profound influence on their economic status in the region. Hence it seemed desirable to again make an inventory of the bird colonies. I was not able to visit all the islands in any one season but several trips made in either May or June of 1947, 1948 and 1949 finally resulted in visits to all the islands. Acknowledgment is due the Sea Scouts (1947), Southern Pacific Company (1948), and Milton T. Rees (1949) for taking me to the various islands. Assistance rendered by the University of Utah Research Fund helped defray travel expenses incurred in connection with the trips in 1947. I am indebted to several colleagues and students who helped band 895 pelicans on Gunnison Island in 1948.

Hat Island.—This island in the past supported a population of thousands of gulls, was used by Great Blue Herons and Caspian Terns upon occasion, and for decades served as the site of a large pelican colony. The island has now been abandoned by all these species. The desertion by the pelicans occurred as early as 1935 (Condor, 38, 1936:220-221) and was associated with a lowered lake level and subsequent loss of protection as the island became connected with the mainland. The colony evidently was reestablished in 1938 (Wilson Bull., 51, 1939:151). That the island has been forsaken again was ascertained by my visit on June 1, 1947. The abandonment of the island by the gulls was discovered, too, at this time. A flock of 13 pelicans and about 200 gulls were present, but there was no sign that either species was nesting. Four deer had wandered over from the mainland. Three Sanderlings were seen on a sand bar. Land birds found there were a pair of Horned Larks, two male Yellow Warblers, two Western Wood Pewees, several Brewer Sparrows, one Rock Wren and a Green-tailed Towhee. Hat Island was deserted by the gulls and pelicans again in 1948 according to David E. Miller who visited it in June of that year.

White Rock.—This rock was visited on June 8, 1947. It still supported a colony of about 700 California Gulls. Three of the latter were collected because they were seen to be wearing bands. It was subsequently determined that the birds had been banded by us at nearby Egg Island in 1939, 1941, and 1942.

Egg Island.—This island was also visited on June 8, 1947. The Great Blue Herons were all gone. The cormorants continued to hold their own, for we counted 94 nests and 122 young. Eighteen of the latter were banded. Most of the young took to the water and we could not capture them. The California Gulls were exceedingly abundant; we estimated that there were several thousand, perhaps as many as 10,000.

Gunnison Island.—Following my census on June 29, 1932, when 3300 nests were counted and it was estimated there were at least 6600 birds utilizing the island, the numbers evidently underwent a reduction, for A. M. Bailey (Bird-Lore, 37, 1935:331) did not find them so numerous in 1935 nor did Cottam and Williams (Wilson Bull., 51, 1939:151) in 1938. By 1943 they still were not as abundant (Behle, Condor, 46, 1944:199). The writer was not able to get to the island in the season of 1947 when the other islands were visited, but fortunately Lee Kay of the Utah State Fish and Game Department made the trip with several associates (Utah Fish and Game Bull., 4(6), Sept., 1947:1, 2, 6). They found that there had been a considerable increase in the number of White Pelicans over previous years. They counted 3123 young pelicans in several colonies and estimated that there were over 700 eggs or young just hatched in colonies that were not disturbed. No attempt was made to ascertain the number of adults but the numbers probably more nearly approached those of 1932 than for any other year to my knowledge. The number of California Gulls they placed at 10,000. Great Blue Herons were in evidence. Ten Rock Wrens and a Prairie Falcon were observed.

I did get to the island the following year on June 11, 1948, with a party of twelve, our major objective being the wholesale banding of pelicans. However, shortly after landing on the island about noon and before there had been much disturbance, I made a sortie to the top of the central peak of the island. From here one could look down on the "saddles" below where the pelicans were

nesting. I tried to arrive at a figure for the total pelican population by sketching the positions of the colonies and estimating the number of adults in each. There were 25 separate colonies varying in size from as few as 25 to as many as 300. The total was 2975 adults. A few were coming in all the time. If in general one adult of a pair was guarding the nest at the time of the count there may have been as many as 6000 birds, in round numbers, utilizing the site. This figure would seem high, however, in light of the nest-count made later in the various colonies which totaled only 1250 nests. If we allow a member of each sex to a nest, the adults would have numbered on this basis about 2500. This would not include some non-breeding birds attached to the colony. Thus the round figure of 3000 birds seen probably more nearly represents the total population of pelicans for Gunnison Island for 1948.

While we will never know exactly how many adults there may have been, it is significant that for a colony in excess of 3000 adults there were only about a thousand young produced, for we banded the great majority of the young on the island. Whereas two eggs are generally laid per nest, the mortality is about 50 per cent, thus resulting in one bird per nest on the average.

There were no Great Blue Herons inhabiting Gunnison Island in 1948 and the California Gulls were still further reduced as compared with their former abundance as noted in 1932. I estimated 25,000 present on this last visit. Other birds seen on the island were the following: Short-eared Owl, Swainson Hawk, Rock Wren, and three Ravens.

On June 11, 1949, another visit was made to the island and the same procedure was followed of climbing to the central eminence with a minimum disturbance to the birds. This time I counted 28 colonies and estimated 3926 or roughly 4000 birds at their nests. As before, groups were returning all afternoon from the feeding grounds to the north and east. No accurate nest count was made although it was my impression that nests were more numerous than in the previous year and that large-sized juveniles were also more abundant. The gulls seemed to be still further reduced, with only an estimated 15,000 present. Two Great Blue Herons were seen but no nests were found.

Discussion.—The changes in the bird colonies of Great Salt Lake involve principally the White Pelicans and California Gulls. In 1932 it was estimated that there were 10,000 White Pelicans breeding in two colonies. Subsequently a long period of drought accompanied by food shortage and lowering lake levels affected the pelicans. The removal of protection through land connections led to the abandonment of the Hat Island colony. The Gunnison Island colony became reduced in size. It is my feeling that a slow recovery is being made from this critical period but the population is only about half that of 17 years ago. The lake level has been rising during the last few years and should this trend continue so that Hat Island is once again surrounded, the colony may become reestablished.

Starting about 1939 and for a few years thereafter, new gull colonies became established at the man-made refuges on the east side of Great Salt Lake, namely the Bear River, Ogden and Farmington Bay refuges. As a result the feeling has grown that the gulls have increased tremendously in numbers in the region. The abandonment of Hat Island as a nesting site and the drastic reduction in their numbers at Gunnison Island serve as evidence that the establishment of the new mainland colonies is not due to an increasing total gull population of the region but to a mass shifting of nesting sites of the species.

When the gulls were breeding at the remote islands and dispersing widely for food over the country to the east and southeast of the lake, they did not seem to be of great economic concern. The "seagulls," as they are locally called, were appreciated for their "following the plough" activities their esthetic appeal and the pioneer tradition of saving the crops. A social taboo prevailed against killing a gull.

Now, within the last few years, concentration of breeding grounds on duck marshes on the east side of the lake which are also in close proximity to cherry orchards along the bench land at the base of the Wasatch Range has been creating problems. It is significant that the attitude of many sportsmen and orchardists is now against this bird which has always been so revered locally because of its part in early Mormon history. Cottam (Condor, 37, 1935:170-171) has discussed briefly the assuming of cherry-eating habits. Some farmers are now shooting the gulls to protect their fruit. Game wardens, refuge managers and sportsmen feel that the predaceous gulls are destroying eggs and young of ducks and other water and marsh birds on the refuges. Sportsmen have passed resolutions condemning the gulls apparently not realizing they are protected by federal law and one hears talk

of "controlling" the numbers of gulls on the refuges. More study is needed on these problems to get the facts. Mr. Clifton Greenhalgh has been making an economic study of the California Gull in the Great Salt Lake region with special reference to food habits. His findings will doubtless have a bearing on these matters.—WILLIAM H. BEHLE, *University of Utah, Salt Lake City, Utah, June 25, 1949.*

The Correct Name for the Mexican Crested Flycatcher.—In the course of a critical study of the types of birds preserved in the collection of the United States National Museum, I have had occasion to examine the type of *Myiarchus cooperi* Baird (*in* Baird, Cassin, and Lawrence, Rept. Expl. and Surv. R. R. Pac., 9, 1858:xxx, 180). I believe there is little doubt that Baird's name must be used for the form currently known as *Myiarchus tyrranulus nelsoni* Ridgway (Bull. U. S. Nat. Mus., 50, pt. 4, 1907:903).

The validity of Baird's name is not affected by *Tyr[annula]. Cooperi* Kaup (Proc. Zool. Soc. London, 19, 1852:51), which is not used by Kaup as a new name, but is simply a misapplication, to an unidentifiable species of *Myiarchus,* of *Muscicapa Cooperi* Nuttall [=*Nuttallornis borealis* (Swainson)].

My view has been shared by Baird (who discussed Kaup's solecism at the place cited), by Nelson (Proc. Biol. Soc. Washington, 17, 1904:25-27), by Osgood (Auk, 24, 1907:219-220), by Richmond (who did not make a card for the combination *Tyrannula cooperi* Kaup in the file of bird names in the U. S. National Museum), by Hellmayr (Cat. Birds Amer., 5, 1927:162, footnote b), and by Dr. H. C. Oberholser, with whom I have recently discussed the case. That Ridgway seemed not to agree may be due to the fact that his manuscript was already in press when Osgood's paper appeared, necessitating a hasty and unconsidered change of name in an addendum. That Hellmayr failed to make the requisite correction resulted from his apparent ignorance of the existence of Baird's name.—H. G. DEIGNAN, *Smithsonian Institution, Washington, D.C., July 25, 1949.*

A Record of the Alberta Fox Sparrow in Manitoba.—A specimen of Fox Sparrow, *Passerella iliaca,* "found dead" at Deer Lodge (near Winnipeg), Manitoba, on October 15, 1932, by Angus H. Shortt, is now no. 29939 in the collection of the Royal Ontario Museum of Zoology. Although the locality is well within the normal range of the typical race, *P. i. iliaca,* the specimen does not agree with that form. In general terms, it is more subdued in color and smaller in size, particularly in wing measurement.

In order to express the degree of peculiarity of the specimen in relation to *P. i. iliaca,* a series of 27 specimens of *iliaca* originating from Yukon and Alberta east to northwestern Ontario and Illinois was graded on the brightness of the reddish ventral markings. Incidentally, specimens from extreme eastern North America were not used because of some evidence that a distinctively bright red or erythristic population may occur there. However, such specimens would be at the opposite extreme from the one here reported. The 27 interior specimens were readily arranged in three grades from bright reddish to dull, or dark, reddish as follows: Grade I, 6 specimens; grade II, 15 specimens; grade III, 6 specimens. Estimated on this scale the specimen in question would fall in a hypothetical grade V, that is, completely out of the scale and beyond the dark end of the series of interior birds. Its ventral streaks are approximately "auburn."

Dorsally also the specimen is distinct from any of the series of *iliaca* from the interior. While the latter exhibit two general phases, that is, a patterned type showing areas of "dark mouse gray" or "olive gray" with areas of "russet" or "mars brown," and a type which has the dorsal grays generally obscured or altered by a wash or streaking of "russet" or "mars brown," the Manitoba specimen is "olive brown" to "mummy brown" on the dorsal region with a central area of indecisive "auburn" streaks. In short, the specimen seems to conform well with the description of the race *P. i. altivagans* of Riley as given by Swarth (Univ. Calif. Publ. Zool., 21, 1920:122). The measurements of the specimen are not out of line with the size range indicated for *altivagans* by Swarth (p. 182).

In reviewing the facts relative to this case, the following seem to bear on the possibility that the specimen is a fortuitous occurrence of a representative of the population of the Alberta Fox Sparrow (*P. i. altivagans*) and not a facsimile of that form arising in *P. i. iliaca*: First, the winter range of both forms coincide in part in southern California. The decoying of an individual of one race into the flock of another resulting in subsequent geographic dislocation seems a reasonable theory

and one used to explain occurrences of western juncos in the east. Thus a representative of *altigavans* could have become geographically dislocated earlier in the year and survived until October. Second, the specimen, taken in mid-October which is a migratory period for the species, could have been an autumn wanderer from the normal breeding range of the race *altivagans* in west-central Alberta. According to our present knowledge of the limits of the breeding range of the form, the Winnipeg region is approximately 900 miles distant. Third, perhaps the most important observation is that the specimen concerned conforms in its color tone and size characters with the Alberta race and when compared with a good sample of specimens of the eastern race originating from the geographic interior of the continent, it does not match any specimen, falling beyond the range of individual variation of that race on the dark end of a graded series. In the opinion of the writer, the specimen represents the first occurrence in Manitoba of *altivagans*.

The foregoing remarks are written in the light of the excellent discussion by Rand (Auk, 65, 1948:416-432) and the timely caution of Blake (Auk, 66, 1949:212-213) on identification of vagrant members of geographic races.—L. L. SNYDER, *Royal Ontario Museum of Zoology, Toronto, June 21, 1949.*

The Starling Reaches the Pacific.—On December 15, 1948, Wesley Batterson brought me a female Starling (*Sturnus vulgaris*) taken that day from a muskrat trap on Nestucca Bay, Tillamook County, Oregon. This specimen is now preserved in my collection. Mr. Batterson also reports that four other Starlings were seen at the same place in a mixed flock of Red-winged and Brewer blackbirds. The Starling has recently been reported from various localities in western Oregon and Washington, but so far as I know, this is the first record of its occurrence in the immediate vicinity of the ocean; it seems then to have reached the limits of its westward expansion in the United States. —ALEX. WALKER, *Tillamook, Oregon, March 15, 1949.*

Further Records of the Starling in Oregon.—Since the writer prepared a specimen of a starling collected in Union County, Oregon (Condor, 48, 1946:94) he has had no positive records of the further occurrence of the species there until February, 1949, when a second specimen was obtained from the hayloft of a barn about eight miles north of La Grande. During the same winter, presumably in December, 1948, a single starling was collected at Enterprise, Wallowa County, by Ted Loughlin, district agent for the Oregon Game Commission. This bird was examined by the writer.

At Malheur Lake Wildlife Refuge five starlings were shot on December 21, 1948, by Dr. R. C. Erickson, refuge biologist. These additional records for eastern Oregon merely augment records from neighboring states of the Great Basin area and indicate the trend of starling settlement.—CHARLES W. QUAINTANCE, *Eastern Oregon College, La Grande, Oregon, June 5, 1949.*

Range Extension of Ash-throated Flycatcher.—On June 8, 1948, the writer saw two Ash-throated Flycatchers (*Myiarchus cinerascens*), apparently migrants, near the McKenzie River ten miles east of Eugene, Lane County, Oregon. These were followed on June 10 by one individual (seen also by Hal Pruitt) and again on May 18, 1949, by a single bird of the species, all using the same route, and feeding and moving slowly northeastward.

Gabrielson and Jewett (Birds of Oregon, 1940:393) list this flycatcher as a not common summer resident of eastern Oregon and of the Umpqua and Rogue River valleys west of the Cascades. The records here reported extend the range for migrants in western Oregon north over one mountain range, the Calapooyas, and down the Willamette Valley to the McKenzie, a total distance of about 75 miles.—BEN H. PRUITT, *Springfield, Oregon, June 13, 1949.*

Black-chinned Hummingbird in Tarrant County, Texas.—On the afternoon of April 5, 1947, in the Botanic Garden in Fort Worth, Tarrant County, Texas, I observed a Black-chinned Hummingbird (*Archilochus alexandri*). This bird, a male, was seen perched for several seconds about 8 feet from me. I called it to the attention of my wife, who noted, as I did, the blackness of the upper throat contrasting sharply with the white of the breast. Upon leaving its perch the hummingbird flew to a honeysuckle (*Lonicera fragrantissima*) nearby where it remained in sight for a short time under good conditions for observation. Long familiarity with the Ruby-throated Hum-

mingbird, the only common species of this locality, leads me to be confident of my identification of the bird.

Sutton (The Breeding Birds of Tarrant County, Texas, Ann. Carnegie Mus., 27, 1938:171-206) questions the occurrence of the Black-chinned Hummingbird reported by Ramon Graham (Nesting Dates of Texas Birds, Oologist, 33, 1916:81-82) as a breeding bird of the county. It has been reported elsewhere as far east as Tarrant County, so there seems to be no reason to doubt the likelihood of the bird's presence here.—PHILIP F. ALLAN, *Soil Conservation Service, Fort Worth, Texas, April 13, 1949.*

Catching Petrels by Flashlight.—On September 6, 1929, I drove with Mr. C. Irvin Clay eight miles north of Crescent City, California, to catch a glimpse of some rocky islets where a few years before he had collected sea birds. We stopped on a grassy plot near the seashore; but the fog had come in and we could see nothing, not even the ocean a few feet below us. The night was quite calm, and presently we became conscious of some light specks passing back and forth above us irregularly, like swallows feeding in the day time. Although we had little hope of being able to discover what they were, we suspected they were petrels. Clay turned his powerful flashlight toward the sky in an attempt to focus on one of these light spots. Suddenly it left its orbit and plunged to the ground at our feet. We found it was one of the small white-rumped petrels, probably *Oceanodroma leucorhoa beali,* the form recorded as frequenting this part of the California coast.

Soon we caught another which had followed down the beam of light and struck the ground near us. After a short trip back to Crescent City to refill the exhausted flashlight, we returned to our petrels and found they were still coursing. We collected two more and stayed on until 10:30 p.m. when most of the birds disappeared. Later I noticed that birds always escaped when the light struck them from behind but when the light hit them full in the face they fell as if shot, hitting my body with considerable force and staying on the ground until picked up. These birds were evidently feeding on night-flying insects, and in striking the ground they vomited the amber colored fluid so characteristic of petrels. Their flight was slow and fluttering.

One of the birds taken (now in Chicago Mus. Nat. Hist.) had white spots on the back of the head, ear-coverts, and chin and a broad white bar across the lower abdomen. As I could find no petrel of this description, I decided it was merely albinistic.—LOUIS B. BISHOP, *Pasadena, California, May 2, 1949.*

A Guerrero Whip-poor-will Impaled by an Insect.—On January 15, 1949, while collecting on some great rocks at the foot of a cliff near the Chiapa River, Chiapas, México, I found a Guerrero Whip-poor-will (*Caprimulgus ridgwayi*) which seemed very awkward. When touched with a long twig, it made no effort to fly. The bird was captured alive by hand and taken to the museum where it was examined. I then discovered in its mouth the head of a dobson fly (*Corydalis cornuta*) with one of the long mandibles and one antenna.

Later, when the bird was being prepared as a study skin, I was much surprised to find the other mandible of the insect thrust through the oesophagus, trachea and skin of the neck; it had further penetrated through the skin of the chest were it was fixed firmly in the breast muscles. All around this place the muscles were full of coagulated blood; the long mandible was as hard as when fresh. The stomach of the bird was empty.

Undoubtedly the bird was to die, but whether the insect bit upon being swallowed or the mandible was pushed through by the bird's movements, it was impossible to determine.—MIGUEL ALVAREZ DEL TORO, *Museo de Historia Natural, Tuxtla Gutierrez, Chiapas, México, March 20, 1949.*

Ground Dove and Black-chinned Sparrow in Southern Nevada.—A single Ground Dove (*Columbigallina passerina*) was observed with Mourning Doves at Corn Creek Ranch, Desert Game Range, Clark County, Nevada, on June 27 and again on June 29, 1945, by Fred Wagner of Texas, A. V. S. Pulling, and the writer. The small size, rufous-red flash of the wings and short black tail served to identify the bird to all three observers who were familiar with the species and who saw it at close range. This seems to be the first record of this species for Nevada.

The Black-chinned Sparrow (*Spizella atrogularis*) was observed in company with House Finches drinking at Cabin Springs in the northern Sheep Mountains of southern Lincoln County during the

first week of July and again on August 3, 1945. Evidently they were nesting in the sagebrush (*Artemisia tridentata*) and juniper (*Juniperus utahensis*) areas nearby since one individual was observed carrying insects in its bill. Well known in the general area, this colony seems to provide basis for extension of the breeding range northward into Lincoln County.—Ross Hardy, *Weber College, Ogden, Utah, February 18, 1949.*

Wood Pewee Pursues Bat.—While camping in mid-August, 1948, in the yellow pine forest (altitude 8500 feet) of the Sheep Mountains of southern Nevada, I was several times surprised to see a small pallid bat flying about in the daytime among the trees at heights of twenty-five to seventy-five feet from the ground. On two occasions, once at mid-morning and once in the early afternoon, a Western Wood Pewee (*Contopus richardsonii*) suddenly dropped from its high look-out perch on the top of a partly dead fir tree and closely pursued the bat for a distance of at least a hundred feet. It is possible that the Wood Pewee was one of a pair which had a nest near and that it chased the bat as a potential intruder, but I could find in its other behavior no direct evidence of nesting. The bat fully sensing the need of escape maneuvered cleverly in zig-zag course and kept the bird from catching up with it. At times the two were no more than six inches apart.—Edmund C. Jaeger, *Riverside College, Riverside, California, May 15, 1949.*

Starlings on Point Reyes Peninsula, Marin County, California.—On February 8, 1949, I observed three flocks of European Starlings (*Sturnus vulgaris*) totaling more than 47 birds about the ranch property at the head of Barries Bay, the westernmost arm of Drakes Estero, Marin County, California. On February 13, a trip was made to the same area with Seth Bailey, Howard L. Cogswell and Robert W. Storer. On this later trip we saw more than 50 birds in at least five separate flocks. Three flocks consisted of Starlings, the fourth of Starlings and Western Meadowlarks and the fifth of a dozen or so Starlings among several hundred Brewer Blackbirds and Red-winged Blackbirds. The flocks were scattered from the ranch at the head of Barries Bay south to the Mendoza Ranch on Point Reyes, a distance of about 4½ miles. A hurried survey was made of the rest of the grassland north of Drakes Estero as far as the Pierce Ranch near White Gulch on Tomales Point, but no Starlings were seen north of the Barries Bay area. The east side of Drakes Bay was not visited.

Numerous birds were observed under very favorable conditions at distances of not more than 100 feet, but the local landowners prevented our collecting any birds. Starlings in both first winter and adult plumage were noted.

Starlings were seen in the same area on February 23, by Mrs. Junea W. Kelly of Alameda and on March 1, by Seth Bailey. When Bailey revisited the area on March 6 and March 20, no Starlings were seen.—Gordon W. Gullion, *Richmond, California, April 26, 1949.*

Vagrant Black-billed Magpie in Ventura County, California.—On April 10, 1946, I saw a Black-billed Magpie (*Pica pica*) eight miles north and three miles west of Piru, Ventura County, California, at an elevation of 4500 feet. The magpie and several ravens were feeding on the month-old carcass of a horse. Two days later the magpie was photographed by Ed N. Harrison of Encinitas, California, as it pecked at the maggot-infested axilla of the carcass. Although vagrancy is common in the Black-billed Magpie, this bird was more than 100 miles south-southwest of the closest published locality of record (Grinnell and Miller, Pac. Coast Avif. No. 27, 1944:292). One would not expect an escaped bird to be found in a dry mountainous area of chaparral and rock several miles from the nearest ranch.—Carl B. Koford, *University of California, Berkeley, California, June 6, 1949.*

Fur Seals and Murre Chicks.—Occurrences have been reported of bird remains in fur seal (*Callorhinus ursinus*) stomachs by Huey (Jour. Mamm., 23, 1942:95-96) and by W. A. Clemens, J. L. Hart, and G. V. Wilby (Analysis of Stomach Contents of Fur Seals Taken off the West Coast of Vancouver Island in April and May, 1935, publ. by Dept. of Fisheries, Ottawa, Canada, 1936). The following observation, as well as the meager records in the literature, indicate that ordinarily fur seals have little or no inclination to eat birds.

On the afternoon of September 1, 1948, I spent about an hour on the cliffs which are adjacent to Ardiguen fur seal rookery on St. Paul Island, Alaska. A mass of several hundred fur seals loafed in the quiet water about a kelp bed just beyond the light surf that broke at the foot of the cliffs. The

cliff ledges were occupied by a number of nesting Kittiwakes (*Rissa tridactyla pollicaris*) and Northern Murres (*Uria lomvia arra*). From my observation point close to the cliff's edge, I could see a number of murre chicks huddled along the ledges. Most of the adult birds had left, and the young thus left exposed ranged from newly hatched to nearly completely feathered chicks. Probably the newly hatched birds were the result of second layings occasioned by the egg gathering of the Aleut boys from the village.

Several of the older chicks were quite nervous and appeared to be nearly ready to leave their ledges. A few adult murres had alighted on the water beyond the gathering of seals, and their soft vocal sounds were plainly audible on shore. Suddenly two of the young murres fluttered at a steep angle from their ledges to the water below. The smaller of the two failed to clear the rocks and was washed about by the waves while it paddled frantically before it finally reached calm water. As soon as it was clear of the rocks, it dived instinctively, remaining under water for about 15 seconds during which it traveled about two or three yards.

Both small birds headed for deep water, chirping loudly, and swimming directly through the mass of fur seals. The parent of one chick answered its calls and joined it as soon as it passed through the seals. The two then swam out to sea together. The parents of the other chick were not present, and it seemed confused by the many seals. For ten minutes I watched it as it paddled and dived among them. During almost all this time, one seal or another swam behind the little bird with its nose nearly touching its tail. Dozens of others sniffed it curiously as it passed them. Although the chick stretched its neck and looked surprised at each curious animal, its only fear reactions were occasional short dives. At no time during its journey among the seals did they show any inclination to snap at or molest the murre. The only apparent reaction of the seals was one of idle curiosity. Mistakes in recognition, when the seal suddenly encounters a diving bird beneath the surface, might account for an infrequent bird being taken by fur seals.—KARL W. KENYON, *Fish and Wildlife Service, Seattle, Washington, June 30, 1949.*

The Incidence of Hybrids in Migrant Blue and Snow Geese in Kansas.—The Blue Goose (*Chen caerulescens*) and the Lesser Snow Goose (*Chen hyperborea hyperborea*) are common spring migrants through eastern Kansas. Hybridization between these two forms has been established by Sutton (Auk, 48, 1931:335-364). Harrold (Auk, 45, 1928:290-292) observed many hybrids in migrant flocks at Whitewater Lake, Manitoba.

On March 11, 12, 13, 16, and 18, 1949, migrating flocks of Blue and Snow geese were observed along the Kansas River, five miles northwest of Lawrence, Douglas County, Kansas. The estimated number of birds observed on March 12 was 20,000 individuals, most of which passed overhead without alighting. On March 13 a flock of 5000 (±500) was observed at rest on a sand-bar in the river. Using a 36× telescope, a count of 2120 of the geese was made. Of these, 1552 (±50) were Blue Geese, 426 (±10) were Lesser Snow Geese, and 142 were hybrids. Most of the hybrids were similar to those described by Harrold (*loc. cit.*) and figured by Sutton (*op. cit.*, pl. V), having the underparts white with a dark band across the breast. At least two hybrid individuals were noted which had the entire underparts white, the breast band being absent.

The 142 hybrids comprise 6.7 per cent of the total of 2120 birds counted. This figure is undoubtedly low since an individual bird could be determined to be a hybrid only if its underparts could be seen and if it was not hidden behind other birds. Assuming that equal numbers of birds would be facing each direction we would be unable to see the underparts of one-fourth of the hybrid birds, namely those facing directly away from us. If this is true, we would miss 47 hybrid birds for this reason and our theoretical number of hybrids rises to 189 or 8.9 per cent of the total of 2120 counted. There is no way to correct the figures for those hybrid birds which were hidden behind their companions, but it is safe to assume that hybrids comprised at least 10 per cent of the migrant flock which passed through eastern Kansas.

Harrold (*loc. cit.*) has suggested that greater numbers of hybrids occur at the western edge of the migratory route of the Blue Goose. Comparative counts along the eastern margin of the flyway and on the wintering grounds would be of interest.

I am indebted to Mr. Roger O. Olmsted for assistance with the field work.—CHARLES G. SIBLEY, *University of Kansas, Museum of Natural History, Lawrence, Kansas, May 20, 1949.*

NOTES AND NEWS

Fig. 53. Hoyes Lloyd, president of the American Ornithologists' Union, 1946-1948.

The colored frontispiece portrays a Red-breasted Chat (*Granatellus venustus francescae*) painted by Andrew Jackson Grayson. In January, 1865, Grayson made a trip to the Tres Marías Islands, México, and collected the specimens on which the painting is based. This race of the species was named for Grayson's wife, Frances, by Baird. The following extract pertanent to this chat is taken from Grayson's manuscript on the "Birds of the Pacific Slope," volume 1, pages 152-154:

"Habitat Tres Marias Islands near the coast of Mexico in latitude 21° 30′ and longitude 106° 30′.

"This remarkable and handsome little bird seems to be peculiar to the islands of the Tres Marias. Not having elsewhere met with it, nor seen any published account of it, it may be a bird new to ornithology.

"It is not common or abundant even on the islands, and is peculiar in its habits.

"I always found it in the low underbrush hopping about among the decayed brush near the ground in search of insects. It may be seen at every move jerking up and spreading its tail like a fan—at the same time its head motionless and bent towards the ground and its wings somewhat recumbent as if looking intently for its prey, seldom uttering a note. This is almost its constant habit, as I had a good means of observing from the fact of its docility, allowing me to approach very near without much apparent concern at my presence.

"It is not so active as the generality of titmice, but its characteristics are not dissimilar in many respects.

"In classifying it as belonging to the Paridae, I do so without having any means of reference or specimens for comparison. Such being the case I may be mistaken and will be pleased if corrected. If it is a *Parus*, it is a very remarkable species as well as a very handsome one." [Grayson had at first thought this bird to be in the genus *Parus* and suggested for it the name *Parus rosea*. It is, of course, a warbler, family Parulidae.]

Howard L. Cogswell and Keith L. Dixon have recently assumed duties as Assistant Editors of the Condor.

We report with deep regret the death of three leaders in western ornithology and in Cooper Club affairs:

Henry W. Carriger, an honorary member of the Club and past president of the Northern Division, was for over fifty years a thorough student of the birds of central California and assisted importantly in the business affairs of the Club.

Harold Michener, an honorary member of the Club and past president of the Southern Division, for a long period led, with Mrs. Michener, in the development and pursuit of bird banding on the Pacific coast and contributed many highly significant articles on behavior, plumage, and the seasonal occurrence of marked birds.

Adriaan J. van Rossem, past president of the Southern Division of the Club, and lately a member of the board of directors, was of world-wide reputation as a taxonomist and nomenclaturist and was particularly skilled in the classification of the birds of the Pacific coast, México, and Central America. He was a recipient of the Brewster Award. To the very last he remained an active and extremely enthusiastic field investigator.

At the Sixty-seventh Meeting of the American Ornithologists' Union, in Buffalo in October, 1949, the following were elected fellows: Dean Amadon, John T. Emlen, Jr., George H. Lowery, Jr., J. Dewey Soper, and R. M. Strong. Persons elected to the class of full membership were: John H. Baker, George A. Bartholomew, Jr., Harvey Brackbill, Charles L. Broley, Edward B. Chamberlain, William B. Davis, Frank L. Farley, William E. Godfrey, Joseph C. Howell, Junea W. Kelly, R. J. Longstreet, Seth H. Low, Thomas H. Manning, Harold D. Mitchell, George A. Petrides, Chandler S. Robbins, Charles G. Sibley, Robert E. Stewart, Charles Vaurie, Laidlaw Williams. Honorary fellows were Robert A. Falla, Alessandro Ghigi, and R. E. Moreau. Officers of the preceding year were reelected. New council members were Ira N. Gabrielson, Ludlow Griscom, Ernest Mayr, and A. W. Schorger.

Applications for the 1950 Louis Agassiz Fuertes Research Grant of $100 are now in order. Information may be obtained from the June, 1948, issue of the Wilson Bulletin. Details and application blanks may be obtained from the chairman of the committee, Dr. Charles G. Sibley, Department of Natural Sciences, San Jose State College, San Jose, California.

PUBLICATIONS REVIEWED

THE FLIGHT OF BIRDS ANALYZED THROUGH SLOW-MOTION PHOTOGRAPHY. By John H. Storer. Cranbrook Institute of Science Bulletin No. 28, xvi + 94 pp., frontispiece and 176 figures. Cloth binding. $2.50.

As a photographer whose beautiful slow-motion pictures of birds in flight are outstanding, Mr. Storer is well qualified to describe the intricate movements of birds in flight. In this compact book he endeavors to explain, in terms of simple aerodynamics, the movements of the feathers and wings of birds as revealed by his photographs. The analogy between bird and plane is more strongly emphasized than in any previous book on this subject.

The principles of the aerodynamics of the aircraft wing which the author feels to be important in the flight of birds include lift, drag, flaps, slots, pressure distribution, tip vortex, and loading. Dihedral angle, of seeming importance in soaring, is not mentioned. In the section entitled "The bird's flying equipment," feather and wing structure and wing adaptations are discussed. Here the main variation from previous works is that the propeller-like action of the primaries in flapping flight is emphasized. The primaries act like a variable-pitch propeller and at times the bird "becomes a helicopter." The last section, comprising two-thirds of the book, is entitled "Flight," and includes discussions of landing, takeoff, soaring, speed, and maneuverability. Finally there appear a one-page glossary, a three-page index, and a list of ten references.

Most of the failings of the text involve the references. Extensive works on bird flight such as those by Horton-Smith, Hankin, or Headley are not mentioned. No references on flight antedating 1937 are considered. The basic questions raised by previous workers, such as whether birds can soar in a horizontal wind of varying velocity and exactly how a soaring bird steers, remain unanswered. No references are given for many statements which one might want to verify, such as those that the space between the wing and tail acts like an airplane slot, that some birds cannot take off or land without the alula, and that birds flying in formation use the energy from the wing tip vortex of the bird ahead. It is confusing to find Poole's term "wing ratio" used interchangeably with the established term "wing loading," for these terms denote reciprocal values. It is stated (p. 75) that Poole found that the heavier sex has a lower "aspect ratio" whereas the cited author was referring to wing ratio. The dates given for the works of Poole and Graham are different in the text and in the list of references. Some of Cooke's questionable records of speed, such as 180 miles per hour for a Duck Hawk, are repeated.

The work of Woodcock correlating observations of the soaring of gulls with experimental patterns of rising air currents over a uniform source of heat is cited at length to explain soaring over the ocean at altitudes above obstruction currents. Previous authors have explained such soaring in terms of the increase of wind velocity with altitude. Observations of soaring in the tropics in the absence of wind, such as those made by Hankin, might well be reexamined in the light of the findings of Woodcock.

Most of the figures are halftones, one and one-half by two inches in size, evidently enlarged from 16-millimeter motion picture film. These pictures are adequately sharp to illustrate the text although they lack definition. About one-half of the pictures of birds are of the American Egret. The designation of the time between exposures in a series is variously given in frames, in fractions of seconds, in both, or in neither.

The study of the flight of birds through observation and ordinary slow-motion photography is now well into the period of diminishing returns. Marey photographed gulls at a rate of 50 pictures per second before man could fly and Mr. Storer's pictures were taken only two and one-half times as fast. For further advance in the study of bird flight we need experimentation and new methods such as stroboscopic photographs of birds flying in a wind tunnel where air currents can be controlled.—CARL B. KOFORD.

COOPER CLUB MEETINGS

NORTHERN DIVISION

JUNE.—The regular meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, June 23, 1949, at the University of California, Berkeley, California. The following proposals for membership were read: Mrs. Lucile S. Waite, 342 63rd St., Oakland 9, Calif., and Ethel Bumbaugh, 394 Orange St., Oakland 10, Calif., by Junea W. Kelly; and Mrs. Bertha M. Rice, P. O. Box 1147, San Jose, Calif., by Lois C. Taylor.

The program for the evening was devoted to several extensive field reports from members. Included was a report by Henry Childs on his studies of 30 nesting pairs of Brown Towhees on the University of California campus.—LOIS C. TAYLOR, *Acting Secretary.*

SEPTEMBER.—The regular meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, September 1, 1949, at the University of California, Berkeley, California. The following names were proposed for membership: Miss Louise F. Perring, 4821 Cedar Ave., Philadelphia 43, Pa., by Junea W. Kelly; Philip Hanford Arend, 2399 Prospect Ave., Berkeley 7, Calif., by Paul Covel; Vincent Surr, 64 Panoramic Way, Berkeley 4, Calif., by Wade Fox; William D. Thompson, 541 Wildwood Ave., Jackson, Mich., by Alden H. Miller; and Juan C. Esteban, Instituto Miguel Lillo, Tucumán, Argentina, by Frank A. Pitelka, the last for life membership.

Mr. Childs reported for the conservation committee that Berkeley Aquatic Park is to be maintained and improved. John Davis described the capture of a young Arctic Three-toed Woodpecker in Reds Meadows. John Chattin reported that health conditions for waterfowl in the Tule Lake and Klamath Refuges have greatly improved.

Dr. George A. Bartholomew, Jr., the speaker of the evening, discussed the "Effect of Day-length and Light Intensity on Reproduction in Birds."—LOIS C. TAYLOR, *Acting Secretary.*

SOUTHERN DIVISION

SEPTEMBER.—The regular meeting of the Southern Division of the Cooper Ornithological Club was held on September 27, 1949, at the University of Southern California. The following names were proposed for membership: Lawrence B. Chapman, 1 Woodridge Rd., Wellesley 81, Mass., and James Henry Bruns, St. Francisville, Louisiana, by W. L. Chambers; Mrs. Herbert C. Judd, 1715 N.E. Buffalo St., Portland 11, Oregon, by Sidney B. Peyton; Dr. Ray C. Erickson, Malheur National Wildlife Refuge, Box 113, Burns, Ore., by S. G. Jewett; Mrs. Ernest Koch, 1188 Dolores St., San Francisco 10, Calif., by Junea W. Kelly; Ronald Arch Ryder, Colorado Cooperative Wildlife Research Unit, Ft. Collins, Colo., by F. A. Pitelka; H. A. Allen, 607 S. Hill St., Los Angeles 14, Calif., Mrs. Ray J. Haley, 950 Leyden St., Denver 7, Colo., and R. D. Sweeney, 460 N. Las Palmas, Los Angeles 4, by W. J. Sheffler; Francis Henry Boynton, 163 State St., Pasadena 2, Calif., J. Fred Denton, 1510 Pendleton Rd., Augusta, Georgia, George J. Dickerson, 6220 Temple Hill Dr., Los Angeles 28, Calif., Mrs. Arthur R. Gunn, 401 E. Sycamore Ave., El Segundo, Calif., Don Johnson, 1435 S. Van Ness, Santa Ana, Calif., James Bradley Nickels, 13157 Valley Vista, North Hollywood, Calif., Robert A. Norris, 165 Wilcox St., Athens, Georgia, and Lorna Weber, 403 S. Sycamore Ave., El Segundo, Calif., all by C. V. Duff. The Southern Division voted unanimously to elect Stanley G. Jewett, J. R. Pemberton and John McB. Robertson to Honorary Membership in the Club. [Similar action in concurrence has been taken by the Northern Division.]

W. N. Jupe presented a colored motion picture, "Desert Birds," which included a life history of a Costa Hummingbird. He also showed a short film on the Great Gray Owl in the Yosemite region.—DOROTHY E. GRONER, *Secretary.*

OCTOBER.—A special meeting of the Southern Division of the Cooper Ornithological Club was held on October 4, 1949, at the University of Southern California. The following names were proposed for membership: William N. Jupe, 3450 Primera Ave., Los Angeles 28, Calif., James Black Meyer, Jr., 4523 Firmament Ave., Encino, Calif., and Lewis C. Sommerville, Lodi Academy, Lodi, Calif., all by C. V. Duff.

Jean Delacour, the speaker, compared some European, African and Asiatic forms of birds with certain local western North American species.—DOROTHY E. GRONER, *Secretary.*

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